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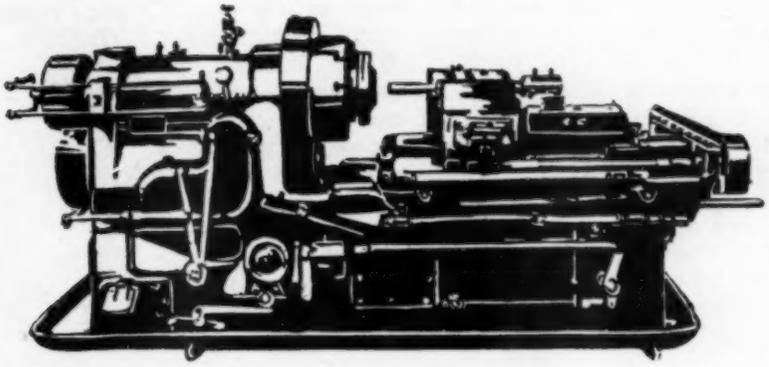
What Obsolete Equipment Costs



Losses from neglect to utilize improved equipment are evaluated for specific examples in the automotive industry

WHEN a machine tool falters in the daily race of efficient production, whether through increasing maintenance demands or through its inability to meet specific standards of accuracy, its fate is sealed. No shop can afford it floor space. Such equipment pays greater dividends on the scrap heap than in the machine shop.

However, a fully depreciated machine may not be the greatest contributor to high manufacturing costs. One which raises no flag of warning, by broken parts or spoiled product, may shelter a more insidious loss. This machine turns smoothly its allotted task as though it were actually contributing to its share of the profits; it is still capable of production within the desired limits of accuracy; it is not prominent as a trouble maker.

But it is obsolete. Another machine has been designed to perform the same work in a shorter time. Shop space upon which the improved tool has just economic claim is filled by the obsolete unit.

It is true that the new machine entails an added investment. Its selection requires care; its installation consumes time. The present equipment may represent a sizable book value. Will not its scrapping look bad on the cost records or invite criticism toward the wisdom of its purchase? Will the improved design in fact attain economies sufficient to overshadow its cost and the inconvenience incident to placing it in the shop? May not future advances in turn render obsolete the contemplated acquisition?

Progress demands that machine improvements be welcomed—not viewed with apprehension. The replacement of equipment, not fully depreciated, is indicative of a progressive point of view. Where such action is based on mathematical justification, it is assuredly not a subject for criticism. To determine more readily such justification, in accordance with engineering practice, certain formulas have been devised. These provide a measure of the cost of obsolescence. The best known of these formulas are those of Warner and Swasey, SKF, and the A.S.M.E.

Three previous articles in *American Machinist* have presented the application of these formulas to specific instances of obsolescence in various industries. The first showed that certain machines in railroad shops cost real money each day they were operated. A second article disclosed that three machine tool builders were currently paying several times over for equipment they had failed to buy. Savings of $20,000 annually were computed for three pieces of equipment used in electrical manufacturing plants in the third.

Often the production man senses obsolescence. He learns of new equipment more effective in handling his work than anything he has at present; he knows instinctively that the purchase of such equipment would prove profitable. Usually, however, this self-conviction is in-

sufficient, inadequate to materialize his ideas. Others without his sureness of manufacturing vision must be convinced, and in dollars and cents. If through its description of a method of attack, this article aids the production man in presenting facts to establish obsolescence, it will have achieved its purpose.

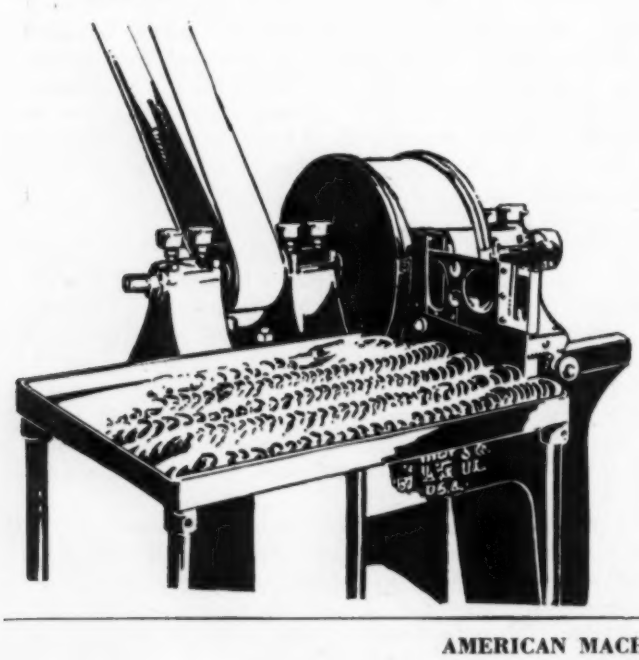
The three formulas will be applied to specific examples in the field of automotive manufacture. Case one consists of a group of four machines used for turning out three sizes of clutch driving drums for trucks. Two semi-automatic turret lathes for roughing and two semi-automatic lathes for the first and second finishing operations are used for this work. The time required for the roughing operation is 12.68 min., that for the second operation 6.13 min., and that for the finishing operation 5 min. Although two machines are used for roughing, this is the limiting operation. The output of the battery of machines is one drum each 6.34 min., but since two operators are required, the production per man is one in 12.68 min. Since the machines are used entirely for drums and the changeover time for one size to another is small, the set-up cost is negligible.

It was found that the same work could be performed successfully by one operator using two modern automatic lathes. The time required per drum is determined by the first machine with a floor to floor time of 5.02 minutes. The operation on the second machine is approximately 3 minutes. Thus there is one piece per man in 5.02 minutes for the new machines against one piece per man in 12.68 for the present arrangement.

Now to apply the obsolescence formulas. The Warner and Swazey method assumes a labor cost of 60 cents per hour and an overhead of 90 cents, making a total of $1.50 per hour or 2½ cents per minute. This would make the

Present	cost per piece 12.68 min. × 2½ cents	$0.317
Estimated cost per piece	5.02 min. × 2½ cents	0.125
Gross savings per piece		0.192

With an 8-hour working day and 280 working days per year also assumed by this formula, the gross annual savings would be: 95.7 (pieces per day) × 0.192 × 280 = $5,150.



Cost of new automatic lathes	$7,583
Cost of special tooling	60
	$7,643

Then the depreciation in this investment would be:

20 per cent depreciation on lathes	$1,517
100 per cent depreciation on tools	60
	$1,577

Deducting this figure from the gross savings there remains ($5,150 — $1,577) $3,573 as the net annual savings to be made by the purchase of the new equipment.

The SKF formula computes the number of months in which the machine investment will pay for itself. It includes several items which for the sake of simplicity were omitted from the Warner and Swazey formula. The SKF method:

$$M = \frac{C_E + C_T + C_{IX} + C_{DX} + V_B}{(R_P - R_E)N_D D_M + S_{OHM}}$$

Where:

M = the number of months in which the equipment will pay for itself
C_E = the cost of the new equipment to be installed
C_T = the cost of tooling the new equipment
C_{IX} = the cost of interest for X years at 6 per cent, X equaling the number of years determined upon as the maximum time during which the equipment must pay for itself
C_{DX} = the cost of depreciation for X years at 10 per cent, X having the same value as above
V_B = the book value of the displaced equipment
R_P = the present rate (cost) per piece
R_E = the estimated rate (cost) on the new equipment
N_D = the number of pieces to be produced per day on the proposed equipment
D_M = the number of working days per month
S_{OHM} = the savings in overhead per month

Five years will again be taken as the depreciation period. Then the values to be substituted in the SKF formula are:

C_E =	$7,583	R_P =	0.317
C_T =	60	R_E =	0.125
C_{IX} =	2,275	N_D =	95.7
C_{DX} =	3,792	D_M =	24
V_B =	800	S_{OHM} =	20

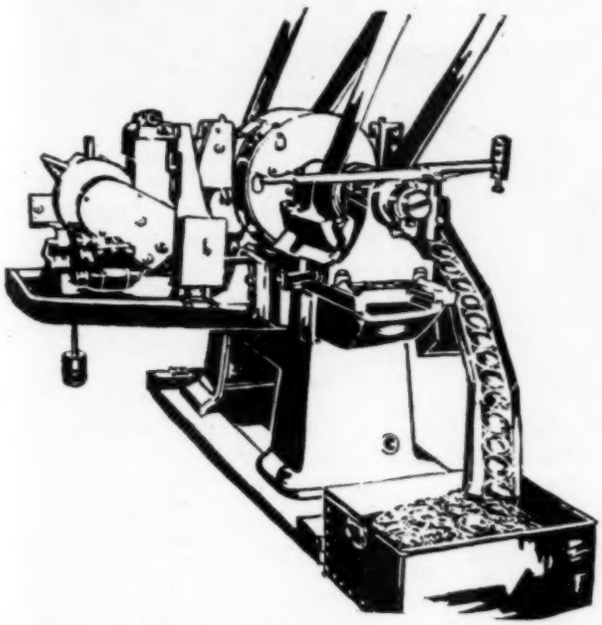
Then:

$$M = \frac{7,583 + 60 + 2,275 + 3,792 + 800}{(0.192 \times 95.7 \times 24) + 20} = \frac{14,510}{462} = 31.5 \text{ months}$$

Since the machines pay for themselves in 31½ months they earn $7,583 divided by 31½ or $241 per month and $2,892 per year. The result is somewhat lower than that obtained for the Warner and Swazey formula because of the inclusion of interest on the full amount of investment as well as the book value of the present equipment. Despite these rigid requirements the savings are attractive enough to justify the acquisition of the new machines.

To measure the obsolescence cost in another manner the more complicated A.S.M.E. formula is used.

A = interest rate, or yearly allowance on the investment
B = yearly percentage allowance for insurance, taxes, etc.
C = yearly percentage allowance for upkeep
E = yearly cost of power, supplies, etc., in dollars
h = expected number of years of life of equipment
I = initial cost of new equipment, in dollars
K = unamortized value of equipment displaced, less its scrap value, in dollars
X = percentage of year equipment will be in use



S = yearly saving in direct labor cost, in dollars
T_a = yearly saving in labor burden, in dollars
T_b = yearly fixed charges on old equipment, in dollars
U = yearly saving or earning through increased production, in dollars
Y = yearly cost to maintain new equipment ready for operation, in dollars (fixed charges)
V = yearly net operating profit from new equipment in excess of fixed charges, in dollars

According to the available data:

A =	0.06	h =	5	C =	0.05
E =	\$ 68			I =	\$7,643
K =	800	X =	$0.93\left(\frac{280}{300}\right)$	S =	2,060
T_a =	3,090			U =	0
B =	0.01	T_b =	\$568		

The formula for

$$Y = I\left(A + B + C + \frac{1}{h}\right)$$
$$= 7{,}643(0.06 + 0.01 + 0.05 + 0.20)$$
$$= 2{,}445$$
$$V = [(S + T_a + U - E)X + T_b] - \left[Y + K\left(A + \frac{1}{h}\right)\right]$$
$$= (2{,}060 + 3{,}090 - 68)\ 0.93 + 568 - 2{,}445 - 800\ (0.06 + 020)$$
$$= 4{,}730 + 568 - 2{,}445 - 208$$
$$= \$2{,}645$$

Some applications of these obsolescence formulas produce rather startling results. A case in point is that of a machine which rough grinds the sides of piston rings. This operation is performed with one operator and a hand fixture, the production being 625 per hour. This was considered an excellent performance until a new roll feed grinder was introduced which handled the same work at the rate of 5,000 per hour.

Applying the Warner and Swazey formula:

Present cost per 1,000 pieces = 96 min. × 2½ = \$2.40
Estimated cost per 1,000 pieces = 12 min. × 2½ = .30

Gross savings per 1,000 pieces = \$2.10
Gross savings per year:
40 (M. per day) × 280 days × 2.10 = \$23,520

Cost of machine	\$3,500
Cost of tooling	0
Total investment	\$3,500
Depreciation (20 per cent)	700
Net saving—\$23,520 — 700	= \$22,820

This represents the remarkable annual saving of 653 per cent on the investment. Now using the SKF formula:

C_E =	3,500	R_P =	0.0024
C_T =	0	R_E =	0.0003
C_{IX} =	1,050	N_D =	48,000
C_{DX} =	1,750	D_M =	24
V_B =	100	S_{OHM} =	0

Substituting these values in the formula:

$$M = \frac{3{,}500 + 0 + 1{,}050 + 1{,}750 + 100}{(0.0024 - 0.0003)40{,}000 \times 24 + 0}$$
$$= 3.15 \text{ months}$$

This would make the annual saving:

$$\frac{3{,}500 \times 12}{3.15} = 13{,}333$$

The annual saving according to the SKF formula represents 381 per cent of the investment. Imagine the lack of foresight which would fail to install a machine which is capable of producing this result.

Using the same figures for the A.S.M.E. formula:

A =	0.06	X =	93
E =	\$40	T_b =	300
K =	100	C =	0.02
T_a =	14,110	I =	3,500
B =	0.01	S =	9,410
h =	5	U =	0

Then: $Y = 3{,}500\ (0.06 + 0.01 + 0.02 + 0.20) =$ \$1,015

$V = (9{,}410 + 14{,}110 - 40)\ 0.93 + 300 - 1{,}015 - 100\ (0.06 + 0.20)$
= \$21,109 yearly net operating savings

Here is a striking example of a loss entailed through failure to keep equipment up-to-date. One operation on as small a part as a piston ring carries an unseen penalty of over \$21,000.

No one would willingly suffer such a loss, but such cases do persist. Their elimination lies in familiarity with new machines and methods, comparison with processes now in use, and systematic evaluation of such comparison.

This article is the fourth in the series "What Obsolete Equipment Costs." Others have appeared in *American Machinist*, Vol. 70, Page 764; Vol. 71, Page 1; and Vol. 71, Page 763. Readers are invited to furnish further instances of losses due to obsolescence. These examples need not be confined to machining operations but may include other fields such as material handling, plating, and heat-treating.

Selection of Sheet Steel for Deep Drawing

By W. H. GRAVES
Chief Metallurgist, Packard Motor Car Company

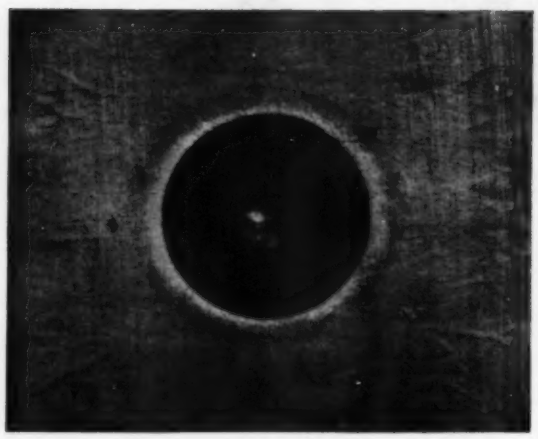


Fig. 1—Back of Erichsen test sample, showing presence of stretcher strains

USUAL practice in determining whether sheet steel intended for deep drawing is satisfactory or not is to set up and try it. If it works, it is satisfactory, but if it fails, how does the metallurgist, the press operator or the steel purveyor know whether improper die set-up, poor press operation, or defective steel causes the failure? The question of sheet steel testing for drawing qualities is closely related to the operation of a press. Therefore, to determine the drawing quality of steel, some study must be made of press operation to know its troubles and problems. Certainly they are many, especially when we consider that there are some dies 50 in. square, and know that sandpaper is used to get proper flow of steel through pressure rings. It takes a great deal of experience properly to determine whether dies or steel are at fault, but once this is determined, laboratory tests are far superior to press room operation for a decision.

We started tests five years ago and soon found, by marking pieces off in two-in. squares prior to stamping, that many good stampings showed as much as 25 to 30 per cent elongation and many broken pieces as little as 5 to 10 per cent elongation. It developed that steels with the same elongation did not always give the same results. Various elastic limit and tensile strength ranges were considered, and it finally was decided that, for extra-deep-drawn parts the elastic limit must not exceed one-half the tensile strength.

This worked fairly well, but the expense of making tests and the fact that a low-tensile strength steel would not work the same in a die as one of high-tensile strength, were serious drawbacks. It was found that, with the pressure rings of the press set properly to form a low-tensile steel, one of high-tensile strength would buckle, and if the rings were set for a high-tensile steel, a low-tensile steel would break.

Further experiments showed that the Rockwell hardness test provides a sufficiently good indication of tensile strength to be depended upon without making tension tests. Beyond question, the Rockwell machine is more accurate in determining difference in steel strength than is the press operator in setting pressure ring pull. It is quite possible to make the same part in a press with steel ranging in Rockwell hardness anywhere from B-30 to B-60, but it cannot be made with the same pressure ring setting. With steels of low Rockwell hardness the pressure rings must be set very loosely; with steel of high hardness they must be set very tight.

A No. 19-gage steel of B-30 Rockwell hardness has approximately the following physical properties:

Tensile strength	44,000 lb. per sq.in.
Yield point	23,000 lb. per sq.in.
Elongation in 2 in.	31.0 per cent

Steel of B-60 Rockwell shows the following results:

Tensile strength	53,000 lb. per sq.in.
Yield point	35,000 lb. per sq.in.
Elongation in 2 in.	36.0 per cent

To draw a steel of the first type, the pressure rings must be set rather loosely to allow the steel to flow between them. If with this same setting a steel of the second type is put in the dies, it will buckle. Conversely, if the pressure rings are set for proper working of the hard steel, and the soft steel is inserted, breakage immediately occurs. Men familiar with pressure ring setting can set the rings for a hard or soft steel, provided they know which is hard and which is soft. It is possible to equip a plant to work a uniformly hard steel regardless of whether the hardness is high or low, with the one exception of spring-back in the die, but it is impractical to teach pressmen to handle a mixture varying from hard to soft or weak to strong.

WITHOUT exception, the Rockwell hardness of steel is a definite indication of the spring-back to be expected. The harder the steel, the greater is the spring-back. The limits to set depend upon the die design. We have found that B-50 maximum prevents excessive spring-back on parts we make. We have tentatively set a limit on hardness of B-43 to B-53 on normalized sheets and believe this to be the most desirable range.

Erichsen tests also were studied, and the test data seemed to tie in with production results so well that we concentrated on its use. It is simple to make and to get check results readily in different laboratories.

Minimum Erichsen values finally set were based partly upon our requirements and partly upon what we could

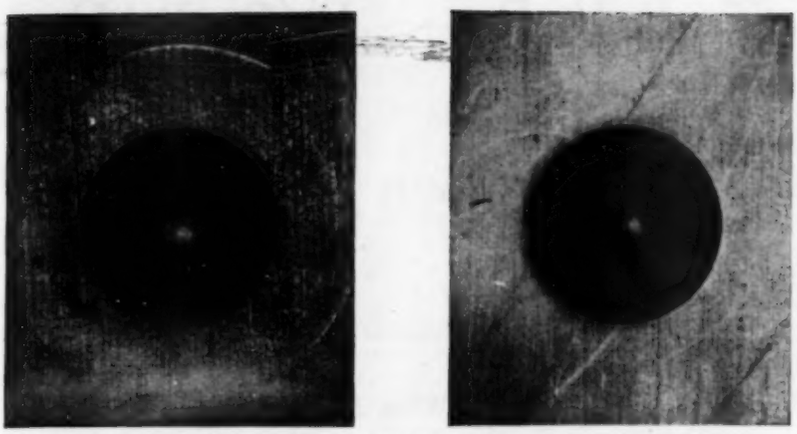


Fig. 2—Difference in drawing qualities of two steels revealed by Erichsen test: left, box-annealed sample, Erichsen 11.0, Rockwell B-38; right, normalized sample, Erichsen 11.0, Rockwell B-45

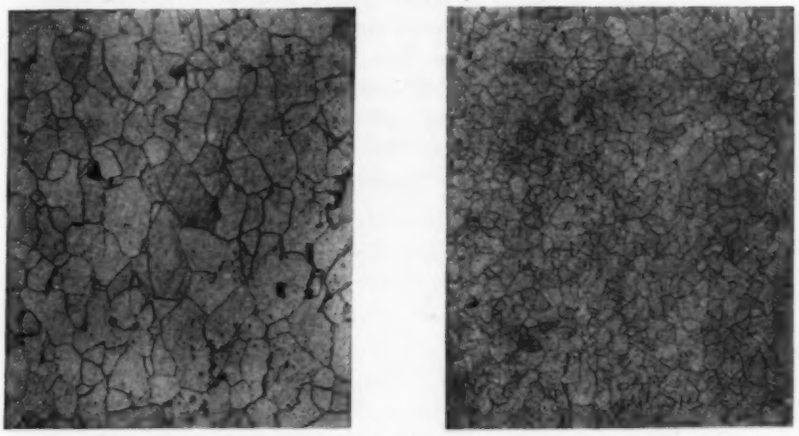


Fig. 3—Photomicrographs showing grain structure of the two steels illustrated in Fig. 2; left, box-annealed; right, normalized

get. Our requirements for sheet for exceptionally deep draws call for a minimum Erichsen value of 11.0 on No. 19 gage normalized steel; and we find that if the steel shows 11.0 or higher, there is practically no scrap. At times the scrap runs higher but if so, and the steel tests within the above limits, the trouble is in die set-up or operation. On deep-drawing steel, usually box annealed, the minimum is 10.5 Erichsen.

Only the two tests described above are used to determine whether or not steel will work in a die. It is believed these are the only tests necessary to determine whether the steel will make the part. If steel meets the requirments specified, we stand all scrap connected with a production run, but if the steel does not meet the specifications, it is rejected.

A VERY good method of inspection or the Rockwell and Erichsen tests consists of taking at random sample 3-in. strips from about 0.5 per cent of the sheets in a shipment. Two strips are taken about 3 or 4 in. from each end of the sheet and the third strip directly across the center. Three Erichsen and three Rockwell readings are taken on each strip.

Other detrimental factors in sheet steel include: stretcher strain; surface finish, before and after forming; thickness tolerance; laminations, and blisters. Steel that will develop stretcher strains can be found with the Erichsen test as shown in Fig. 1. This test has not been used sufficiently to say that all steel which shows strains should be rejected, but it certainly shows up steel that has them. Stretcher strains can be eliminated by cold working after annealing.

Surface finish on sheet steel is at present determined by visual examination. The quality of surface finish required is dependent upon the work done on the stamping during assembly and upon the paint operations. Enameled work probably requires the best type of finish of all classes. In general, extra-deep-drawing steel does not possess the high finish of a medium-deep-drawing steel. It is our belief, however, that a highly polished sheet is of no advantage in the processes of metal finishing, painting, or enameling, but is a serious disadvantage to drawing quality and uniform hardness.

SURFACE finish after forming probably is more important than original finish. Some steels on deep-drawn panels draw very coarse while others draw very smooth. Fig. 2 illustrates the difference between two steels. The Erichsen depression shows a rough surface on the box-annealed specimen, and a smooth surface on the normalized specimen. The photomicrographs, Fig. 3, show the reason for this difference. The fine grain in the normalized steel and the coarse grain in the box annealed specimen are typical of good steel of the two types. Generally it is possible to tell the difference in normalized and box annealed steels by means of the Erichsen and Rockwell test.

A variation of ±0.004 in. in thickness on No. 18 or No. 19 gage steel is not sufficient to cause trouble, providing the steel is of the correct drawing quality. Laminations and blisters occur too rarely to be of major importance.

It is quite possible to divide sheet steels for drawn parts into two classifications only: extra-deep-drawing and deep-drawing. The following values are suggested for No. 18 or No. 19 gage steel:

Extra-Deep-Drawing

Analysis	S.A.E. 1010
Erichsen value	11.0 minimum
Rockwell hardness	B-43 to B-53
Grain Structure	As per standard sample or grain size count

Deep-Drawing

Analysis	S.A.E. 1010
Erichsen Value	10.5 Minimum
Rockwell Hardness	B-43 to B-53

It is possible to make parts with steel having Erichsen values as low as 8.5 or 9.0, but they must have extremely small draws.

Condensed from a paper presented before the American Society for Testing Materials, Detroit, March 19, 1930.

EXECUTIVE · FORUM

Why an Organization Chart?

BOB DUNNING wondered what it was all about. Less than two months before he had taken up his duties as plant engineer of the King Machinery Company. Now he was speeding townward with John Edwards, King Machinery's president, in Edwards' luxurious limousine.

As if in answer to Dunning's thoughts, Edwards remarked, "Perhaps you are somewhat puzzled at this luncheon invitation. I want you to meet an old friend of mine, Bill Holland, who takes a great interest in young men in industry. Should we talk shop, as is likely when Bill is around, do not hesitate to give your frank opinion. Holland has assisted me in an advisory way in the past, and I have entire confidence in his integrity."

In a few minutes they pulled up before the bank building which housed the Manufacturers Club. They found Bill Holland awaiting them and at once proceeded to a table overlooking the city.

"Mr. Dunning is our new plant engineer," Edwards explained to Holland. "We old timers sometimes get our noses so close to the picture that we lose our sense of proportion. You know I have always appreciated a fresh point of view, and I believe Mr. Dunning can provide one. I am going to ask him just what he thinks of our organization."

"I have found my work most interesting," Dunning replied. "Everyone in the plant has gone out of his way to make me feel at home in my new job."

"That's very pleasant," said Edwards, "but not what I want to hear. I want to know our weaknesses—the short-comings which are often more evident to a newcomer than to one brought up in the company."

Dunning considered a moment before replying. "Since you put it that way, Mr. Edwards, there is one point that does not seem entirely satisfactory—the absence of a clear-cut line of authority. I know a plant engineer has lots of loose ends to take care of, and I am perfectly willing to fit in where I will do the company the most good. Now I find myself taking orders from the superintendent, the works manager, the chief engineer, the purchasing agent, and occasionally yourself. I feel that a definite understanding as to whom I report and who reports to me would simplify my position a great deal."

"That's more like it," Edwards approved. "Have you any suggestions to remedy the situation?"

"Many companies use an organization chart," Dunning pointed out. "That seems like a logical solution to me. It shows graphically just where each individual fits in."

"I have always steered clear of organization charts," said Edwards. "My feeling has been that they restrict the personnel too rigidly. Man, like water, if left to himself, eventually finds his own level. It may be a little inconvenient to a newcomer, but men have authority in our company because they have won it. Charts impede this natural selective process."

Holland, who up to this time had been content to listen, now remarked, "An organization chart should be flexible—it should illustrate the managerial set-up but not fix it. Its absence puts a premium on aggressiveness apart from ability, while its use often eliminates sources of friction."

What Do You Think About This Executive Problem?

Organization charts have become increasingly popular during the past few years. Some people have welcomed them as clarifying the lines of authority. Others feel that they tend to freeze an existing executive formula—that they handicap natural adjustment.

The readers of American Machinist will be interested in your opinion on this subject. You have undoubtedly seen organization charts in use. Do they serve constructive purposes? Or do they retard desirable changes? Contributions accepted will be paid for.

DISCUSSION

OF PREVIOUS PROBLEMS

Who Should Do the Firing?

The first consideration is fairness to employees. Numerous factors often prevent workmen from receiving a perfectly fair deal. Excellent machinists are sometimes disposed of by the old method on flimsy excuses, outright pretexts. Or perhaps after a pardonable blunder, they are simply made way with to give room for a relative or a favorite. The same thing frequently occurs under this system where there is a grudge of long standing between the foreman and any of his men. This is especially true if the foreman is inclined to be high-tempered or overbearing.

The opportunity to appeal to a manager in the smaller shop, or to the employment department in the larger shops, is more likely to result in a handling of the case solely on its own merits, avoiding trifling personalities which might unduly color its handling by the snap judgment of the foreman. The knowledge that a man's case will be carefully studied by the employment department or manager, before his dismissal is okayed, will help to eliminate the firing of men for petty or temperamental reasons.

—O. S. WALTERS, *Manager, Garber Tool Company.*

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The Ratio of Raw Materials to Production

In general a manager should have a large enough supply of raw material so that his production is secured. The amount of the supply, of course, depends on the deliveries of the mill. It may be economical to buy more raw material than needed when prices are low and an increase in prices is expected for the future. I remember a case where my factory ordered raw material at very low prices for 50 locomotives. The locomotives were built two years later, when higher material prices prevailed, and we made a good profit. Of course it was a sort of speculation, but on a very sound base. We never have a very low supply of raw material because our shops have comparatively long term deliveries.

—FRANZ BERMANN, *Supt. Locomotive Plant, Licensed Railway Company, Vienna.*

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Should Special Work Be Segregated?

The following plan is one which the writer has used successfully in two plants. It is easy to put into operation and effectually handles the problem of making deliveries on special or service orders.

The first thing every morning the works manager, the production manager, the shop superintendents, and the storekeeper meet in the works manager's office for a short session. All orders which are ready for release to the shop both of new work and of replacement parts are considered and listed. If the order is for a new machine, the production manager, after consulting the plant load chart together with the shop superintendents, sets up a promise date then and there. This date is wired to the customer. If the order is for a replacement part, the storekeeper, states whether the part is in stock or in process. If the part is not stocked, the shop superintendents are able to say how long it will take to make it under existing conditions. If, because of a favored customer, the order requires priority and the setting aside of something else, that decision and its consequences can be taken care of at once. In any case a promise date is set up.

—JAMES K. MATTER.

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Should Estimates Be Given Operatives?

Decidedly not, because the estimates and contract prices of all production are the absolute business of the executives, who are paid high remuneration to do their own job. There is no necessity to give estimates in any department to operatives.

It is a case of a fine piece of mechanism, beautifully conceived and put into operation by the chief executive of the organization. Every part must work and synchronize in unison with every other. The chief executive is the regulator. It is his job to earn his pay, and to see to it that all his supernumaries do the same, by constant analysis and rigid supervison of all the units comprising the highly developed machine. Then, and then only, will efficiency, the machine tool of industry, earn maximum dividends at minimum cost.

—T. W. HOBBS, *Birmingham, England.*

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Should Salesmen Design?

Salesmen, due to their training, specialized work, and temperament, are not generally fitted to design. The most constructive assistance in design which salesmen can render is to bring in criticisms from the field: reports on how customers have improved the machines, customers' suggestions, and the salesmen's own recommendations.

While it is true that the sales department is held accountable for the sale of the new design, it is no more practical to let every salesman have a part in the design than to let each mechanic and helper in the shop take a hand in designing. Everybody connected with the company will bring up suggestions and, where possible, anticipate troubles which are likely to develop in new designs.

On the design of one group of machines, the sales department loaned us a service engineer who had worked on practically every operation in the shops prior to going out in the field. The manufacturing and engineering representatives working on this group found that this serv-

ice engineer's advice and suggestions really "made" these new designs. Our shops had been leaning towards lower costs together with rapid and simplified production, but the service engineer brought the customers' needs to the front. The result of this co-operation was that our company gained about three years on the rest of the industry. —E. E. GAGNON.

What Price Titles?

The practice of conferring a high sounding title, without salary boost is questionable. It is safe to say that few employees are ignorant of the fact that for increased worth they should receive increased reward, and any attempt on the part of the employer to withhold what is honestly due rapidly undermines the organization.

An employee in line for a high sounding title has been intrusted with and proven worthy to handle important work. It hardly seems possible that his employer would expect to be able to pull the wool over his eyes easily. If he can, the title is out of place and will reflect adversely on the entire organization. —J. C. HINTON.

Should a Plant Take an Annual Inventory?

Mr. Holland's contention is one that many accountants have advocated for a long time, namely, that a good stores system will do away with the annual inventory. It won't work. Numerous concerns have come to grief through being too optimistic in valuing their stocks and have distributed profits which really have existed nowhere but on paper.

The aim should be to reduce the shut-down period and, by a methodical pre-arrangement, to clear off as many jobs from the shop floor as possible. One day ought to suffice for this. Have your cost records compiled in such a way that the cost of any of the various products can be ascertained no matter what stage of manufacture they may have reached. Then the problem of valuation is considerably eased. A careful and correctly valued inventory is of distinct value in any financial statement relative to a business as well as in connection with insurance questions. It should not lightly be given up. —T. H. HARGRAVE, *Lancashire, England.*

Who Should Do the Firing?

Some will insist that this authority should be vested only in the superintendent or general manager, the foreman simply presenting the charge against the guilty worker. But the best interests will be served where the foreman is given full right both to command and to enforce obedience to his orders, even to the extent of disposing of an employee's services. He must be privileged to hire and discharge at will. Only in this way, can perfect balance and control be maintained. Without full authority, the foreman cannot secure and hold the respect of the men.

However, there are other conditions—one, whether the foreman is capable of assuming such responsibility. He must not be tempestuous and quick tempered, allowing personalities to influence his decisions. He must never permit religion or politics to influence his feeling and reactions. Finally, and of supreme importance, he must not discharge a man without just cause, if he does this, every other employee will discuss the matter. If the foreman's decision has not been entirely fair and reasonable, the reaction will be detrimental to the establishment. —R. H. DAUTERICH, *The Crescent Engineering Company.*

Sales or Sincerity?

Visiting many hundreds of customers in Europe and selling automatics to them, I have found that if the difference in delivery is not too great between competitive manufacturers, in most cases it is possible for a salesman to sell his machines in spite of longer delivery than that of his competitors. When the goods are needed very urgently, and delivery has to be shortened in any case, it will always be good to show the customer your willingness to serve him as far as possible.

This can be done by calling or telegraphing to the factory (in the presence of the customer) and asking it to do the best to meet this special request. Generally it will be possible to make an agreement in such a way that the time for delivery is only partly shortened, so that the seller as well as the buyer is satisfied.

I found, with European customers, that it is better not to promise a short delivery unless it can be held. It is better business to name a certain date and hold it than to promise an earlier one and not deliver on time.

—WILLI WALLRODT, *Sales Engineer, Ludwig Loewe & Company, Berlin, Germany.*

Equipment Replacement in Slack Periods

There is no doubt that Mr. Wood has studied thoroughly the economies that can be effected by moving into a new building and installing new machinery. Anyone, who has gone through such experience, knows the preparations, that are studied out, the plans made, and the ultimate savings. The time, to prepare for big business, is when we have a temporary, slack period. Even then, it is almost a certainty, that the works will be busy again before the buildings are ready, for plans, buildings, and installation of machinery all take time. In the meantime, the cycle of business is coming around again.

There are many other advantages in building when business is temporarily dull. The

architects are not likely to be busy, plans are gotten out promptly, materials are on the ground without undue waiting, and building is started on schedule. The demand for skilled artisans is not so great, so the turnover is low, and the progress of the building will go along more rapidly, and will be finished on schedule. Anyone, who has had building to follow up in busy times, will appreciate these advantages.

Then, when the new machinery arrives, it will be set up and the old machinery moved, without much hindrance to production. Even though the tidal swing of business had not returned by the time the machinery is all installed, the economies can be seen.

New buildings are more economical to heat, and the lighting distribution, both daylight and artificial, is better; storage facilities for raw materials, the routing of material in process, and the distribution of power are all less costly. The tidal swing of business soon flows upward again, and it has been the experience of others, who prepared to expand during the valley periods, that peaks were in sight again before all the moving was entirely completed.

—HAROLD LAMB, *Master Mechanic, Hookless Fastener Company.*

Who Should Do the Estimating?

The answer to the above question is dependent upon the class of work to be estimated and upon the men available for the purpose. In a small contract manufacturing shop, for instance, it usually is most economical to have the shop superintendent do the estimating, providing that he has the necessary technical ability to thoroughly analyze the job.

In the larger concerns, where requests for estimates are more frequent, this would be physically impossible. In this case, it is best to resort to a division of labor by establishing an estimating department. This department is not in as close contact with the shop as the superintendent of a smaller plant, and it is advisable to have it call for time estimates from the various foremen very much as an outside concern would. The foremen's time estimates should then be checked and combined with the cost of the materials required.

It has been the writer's experience that most foremen underestimate the time required to do a certain job and it will be frequently necessary for the estimating department to raise the time allowance and to keep a careful check on foremen's estimates. Better results are obtained when the estimates are prepared by those responsible for results. Making the foreman a party to the estimate, places the responsibility of delivering the goods in the estimated time squarely upon him, and he naturally takes more interest in doing so than when the time estimate is prepared by some one else.

—C. E. SCHINMAN, *Production Engineer, Aero Products Co.*

Who Should Control Routing?

McMurray is not a hopeless oldtimer, but he must not have kept up with modern developments. He cannot be a works manager in truth if an independent department controls routing. He can, however, welcome the production engineering talent which Harry Bowman can supply to him.

When old J. J. Masfield determined to ease off in active management, he should have sat down with McMurray and Bowman, placed the responsibility upon the works manager for results, and pointed out to both the co-operative work to be done by Bowman. Team work would keep customers satisfied with deliveries; the "one-man" idea would disappear. Bowman would absorb good from McMurray's experience and qualify for a real executive job on the latter's retirement.

—WALTER F. GILCREAS, *Cost Accountant.*

To Whom Should the Chief Inspector Report?

The chief inspector should report to the chief engineer, the executive most capable of interpreting specifications and one who possesses the necessary status and technical ability to make overtures to the customers, if occasion arises to ask for extended privileges. The chief engineer should O.K. all specifications and rule out such "selling talk" that is not within the power of the shop to fulfill. As little as possible should be left to the inspector's judgment; he should be ruled by specifications and comparisons. When a departure from these occurs, it should be clearly stated in his report to the chief engineer, and the work held pending a decision.

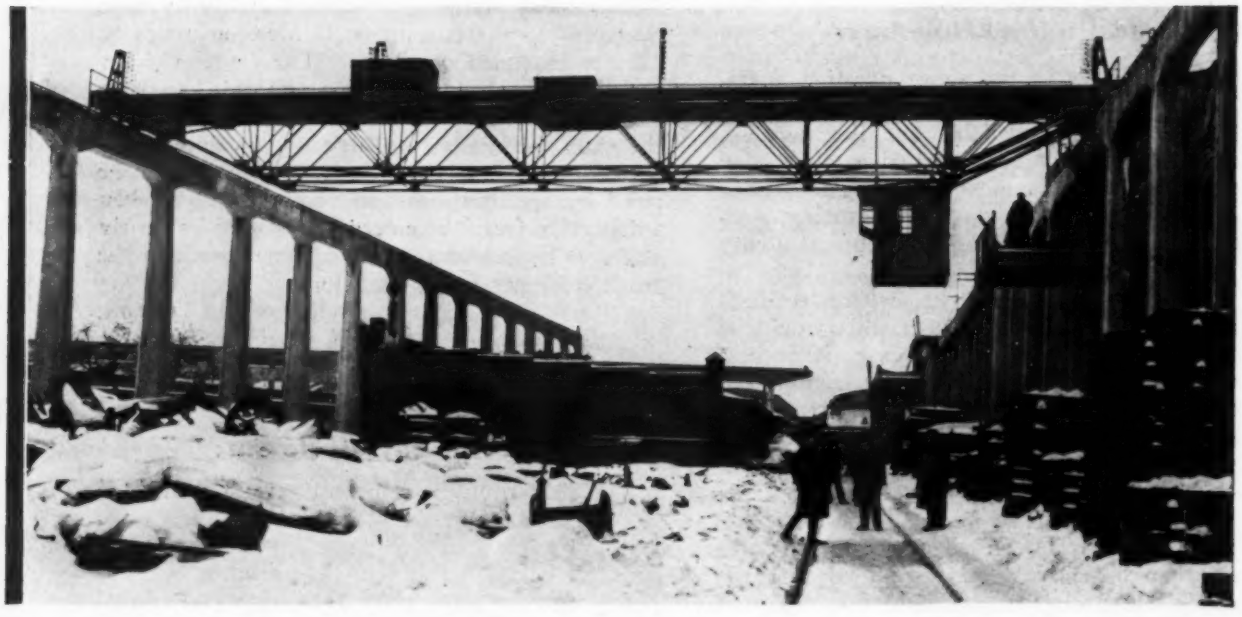
—JAMES G. TURTON, *Heald Machine Company.*

Should Price or Payroll Be Cut?

This problem came up several years ago in two shops. One shop took work at a low price and lost some money. They kept an exact account of costs on this job. Later when business picked up, the same class of work was required by the same firm. A price was bid that would give a fair profit. There was objection to this because of the other contract. The books were brought out and actual costs divulged. The firm acknowledged the reasonableness of the extra price and granted the contract, because the former contract and work had been satisfactory.

The second firm took the work at a low price expecting a loss but the superintendent called the men in, explained conditions and asked their assistance. The job netted a small profit. It also netted two suggestions for doing the work so that on a future contract big profits resulted.

—C. G. WILLIAMS, *Chief Engineer, Green Bay Barker Machine & Tool Works.*



More Views From a European Car Shop

UNDER the title of "American Management Methods in a European Car Shop" (Page 511, Vol. 72) Wallace Clark described how his firm of industrial engineers transformed the workings of a century-old plant. This article was mailed from Europe.

Since then, Mr. Clark has returned to the United States with two more photographs. The upper shows one section of the "car-erecting hall," an example of straight-line methods and good industrial housekeeping; the lower illustrates an unusual use of concrete to support a traveling crane.

Training by Intention

Beginners learning the first step in the universal shop language

Planned training in skill, knowledge, and morale replaces the haphazard apprenticeship of yesterday

By G. Guy Via

Supervisor of Training,
Newport News Shipbuilding & Dry Dock Company

APPRENTICESHIP has been an institution in the plant of the Newport News Shipbuilding & Dry Dock Company, from its establishment, and more than two thousand youths have knocked at and passed through this door of industrial opportunity since 1889. Today some of these men are to be found in every corner of the globe and on the seven seas, designing ships, building ships, operating ships, and managing shipping, while others have strayed into other useful industrial pursuits more or less allied to moving the world's commerce. Apprenticeship is the foundation of each of these careers.

In years gone by, the lot of the apprentice was not an easy one. Long hours, low wages, and hard knocks were a part of the daily task, while social ostracism by the community was almost inevitable. In the midst of rapidly multiplying wealth, fine craftsmanship lost caste in the eyes of a thoughtless world until finally there came a time when only less favored boys would consider accepting these conditions of employment, and this ancient and honorable system of training youth was thought to be almost a thing of the past. In fact, large numbers of industries actually discontinued apprenticeship without realizing that the faults were almost entirely their own and the remedies lay in their own hands.

Apprenticeship can, and indeed, must be made attractive and effective else industry will find itself in a sad state within a generation; for in the last analysis, the well-trained mechanic is the backbone of any organization, and that backbone must be continually strengthened and supported or the body will eventually collapse. Fair play demands that each plant contribute its share of training to the general cause.

Realizing these things, many thoughtful men began to apply themselves to a serious study of the problem, and disclosed some interesting facts not altogether complimentary to the manner in which apprentices had been formerly handled. Faults were noted and corrected; abuses (and there were many) were sifted out and abolished; weaknesses were identified and strengthened. Best of all came an understanding of the principles underlying effective training, so that orderly intention now replaces haphazard job contact, and apprenticeship has again begun to flourish as never before in our history.

Fortunately for the youth of Virginia, the "Yard" had as its president during this critical period a far-sighted executive who never lost his faith in boys—Homer L. Ferguson. He has often stated publicly that every boy deserves a chance, and has demonstrated again and again in most substantial manner his faith in young manhood. If the development of a training program is in direct proportion to the interest of management in the project, then the apprenticeship system of the Newport News Shipbuilding and Dry Dock Company deserves to rank with the foremost in the nation.

A WELL-BALANCED program will take into account three H's—the Hand, the Head, and the Heart, and adequate provision must be made for the development of each, according to Richards' formula for effective training. The hand of the learner must be trained to do, the head to think, and the heart to feel; and the program must address itself to each in turn. At Newport News a staff of twenty-seven carefully chosen and carefully trained instructors devote full time to the manual, mental, and moral development of two hundred and forty apprentices in the following crafts:

anglesmith	draftsman, joinery	painter and decorator
blacksmith	draftsman, machinery	plumber and lead burner
boilermaker	draftsman, piping	sail maker
coppersmith	electrician	sheet metal worker
draftsman, electrical	joiner	ship carpenter
draftsman, hull	machinist	ship fitter
draftsman, hydraulic	mold loftsman	ship rigger
	molder	

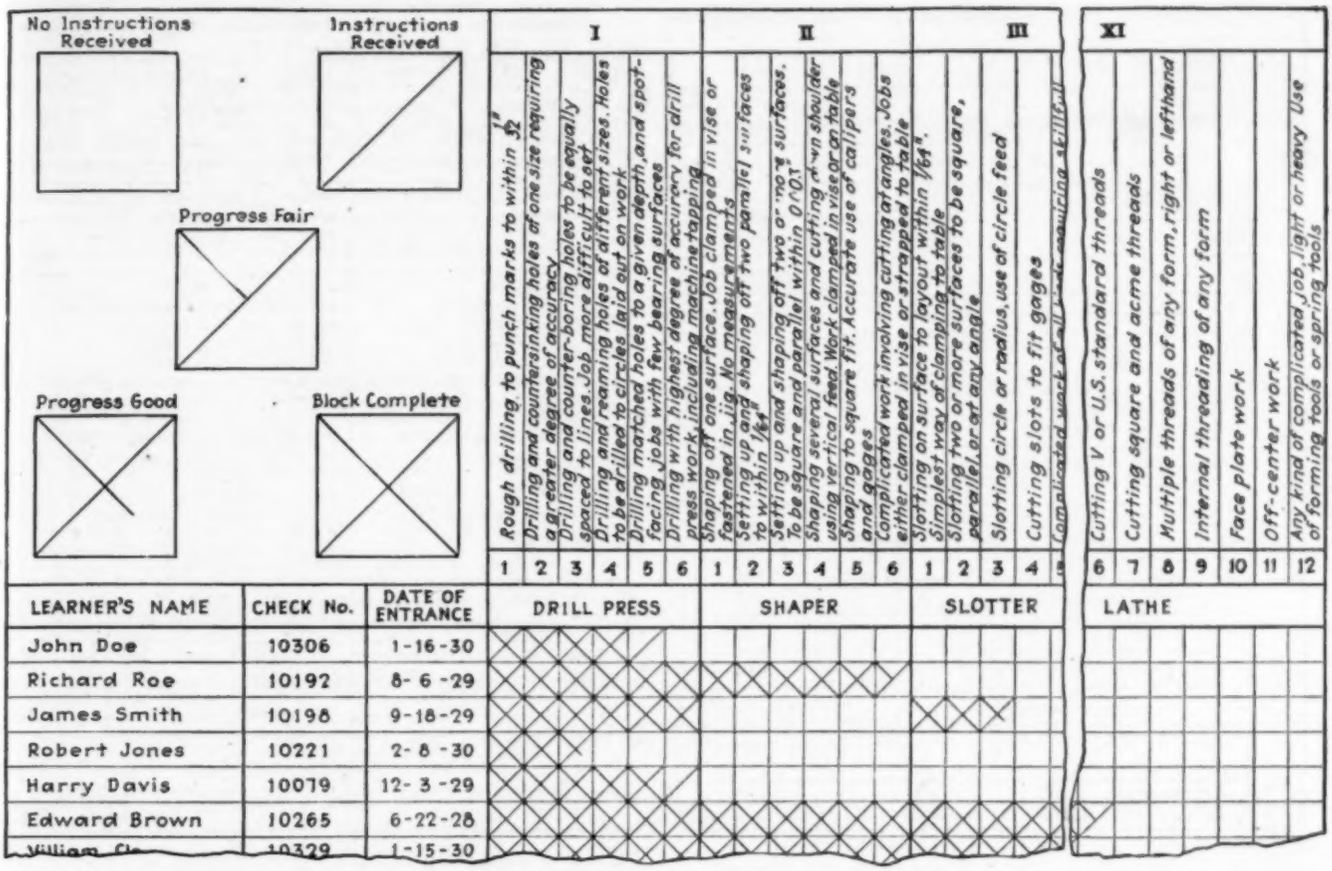
Responsibility for the entire program is vested in the supervisor of training who reports directly to the superintendent of personnel, thus making an almost direct contact with the management of the company.

The supervisor and his staff interview the applicants (all other persons are interviewed at the employment office), select the candidates for apprenticeship, train them in the shops, educate them in the apprentice school, keep all training records, supervise their extraneous activities, and in fact take complete charge of the boy during his training period. The production supervisors, foremen, and superintendents, show a very fine spirit of co-operation in providing suitable jobs for the boys to work on, a most important contribution as will later be shown. As all departmental expenses are budgeted, the cost of training the boy during the first two years is borne by the management, and the departmental budget is increased by this amount; the department is further credited with all work done by the boy during this period. This encourages maintaining a suitable number of boys in each department as well as a suitable flow of jobs through the training group. The last two years are spent by the boy in the shop on actual production work and under the regular production supervisors, gaining experience. His training will by then have been completed, and speed and judgment only will be lacking.

THE instructors are carefully chosen from among the most skillful and intelligent craftsmen in the shop. A good instructor should like boys; he should like teaching; and a suitable differential in pay is made in order to lend attractiveness to the job. When first selected, these instructors undergo an intensive course of training for a period of two weeks in the fundamentals of teaching; a much-abbreviated normal course. Here they learn analysis of all kinds, which will later play such an important part in their work. For the first time they come to an understanding of the four standard steps in teaching, the Herbartian steps—(1) preparation, (2) presentation, (3) application, and (4) testing. They become acquainted with interest factors and their use in

Physics and chemistry are tied up to actual operation

This large casting was molded and poured by two apprentices


No Instructions Received
Instructions Received
Progress Fair
Progress Good
Block Complete
I
II
III
XI
Rough drilling to punch marks to within 1/32"
Drilling and countersinking holes of one size requiring a greater degree of accuracy
Drilling and counter-boring holes to be equally spaced to lines. Job more difficult to set
Drilling and reaming holes of different sizes. Holes to be drilled to circles laid out on work
Drilling matched holes to a given depth, and spot-facing jobs with few bearing surfaces
Drilling with highest degree of accuracy for drill press work, including machine tapping
Shaping off one surface. Job clamped in vise or fastened in jig. No measurements
Setting up and shaping off two parallel surfaces to within 1/64"
Setting up and shaping off two "no" surfaces. To be square and parallel within 0.001"
Shaping several surfaces and cutting a "in shoulder using vertical feed. Work clamped in vise or on table
Shaping to square fit. Accurate use of calipers and gages
Complicated work involving cutting at angles. Jobs either clamped in vise or strapped to table
Slotting on surface to layout within 1/64".
Simplest way of clamping to table
Slotting two or more surfaces to be square, parallel, or at any angle
Slotting circle or radius, use of circle feed
Cutting slots to fit gages
Complicated work at all times requiring skilful
Cutting V or U.S. standard threads
Cutting square and acme threads
Multiple threads of any form, right or lefthand
Internal threading of any form
Face plate work
Off-center work
Any kind of complicated job, light or heavy. Use of forming tools or spring tools
1 2 3 4 5 6 1 2 3 4 5 6 1 2 3 4 5 6 7 8 9 10 11 12
LEARNER'S NAME
CHECK No.
DATE OF ENTRANCE
DRILL PRESS
SHAPER
SLOTTER
LATHE
John Doe 10306 1-16-30
Richard Roe 10192 8-6-29
James Smith 10198 9-18-29
Robert Jones 10221 2-8-30
Harry Davis 10079 12-3-29
Edward Brown 10265 6-22-28
William Cl... 10329 1-15-30

There are those who claim it is not possible to keep track of the learner's progress

maintaining the learner's interest in his work. Thus equipped they are sent into the shops on their jobs.

Weekly thereafter they meet for two hours in a study of some subject directly pertaining to their work, such as vocational psychology or industrial economics. These courses are conducted by authorities on the respective subjects, brought into the plant for the purpose. In addition they meet monthly for an entire evening to be devoted to more practical phases of their jobs. These monthly meetings are usually headed up by the supervisor of training, and are conducted on a conference basis. Many valuable contributions to the subject of vocational training have grown out of these conferences and will be published in book form at a later date. The intent of this outside work is to broaden the mental horizon of the instructors, and it has proved most effective in maintaining morale on a high plane.

CARE is exercised in choosing the limited number of boys who may profit from this course. The successful applicants must be morally, physically, and mentally fit. All other considerations being equal, preference is shown sons of employees. A very careful study is made of each applicant's qualifications at the first interview, at which time he is also given certain tests devised to determine mechanical aptitude, general intelligence, alertness, etc. If these prove satisfactory, his name is added to the list of applicants in waiting, from which list the most promising applicant is chosen whenever a vacancy occurs. Often a boy is given a job as a helper for six or eight weeks prior to acceptance so that a further study of his fitness may be made. *At present there are more than three hundred names on the waiting list.* If the course is made attractive, there will be no scarcity of candidates.

Nothing contributes more to the success of any training program than the selection of proper human material with which to work. Years of study have been given to this important problem, and a number of unusual facts have been brought to light which cannot be encompassed in the present article. It is interesting to note, however, that the ideal applicant will posesss about the following limiting qualifications: he will be not less than eighteen years of age, will have had at least three years of high school work. He will be not less than five feet, six inches in height, and weigh not less than one hundred and forty pounds. He will be muscular, and not fat. His character and reputation will be excellent, and his home conditions will be good. Each of these characteristics has a sound psychological or physiological foundation as has been demonstrated over and over again in practical experience, admitting, of course, of occasional exceptions.

Training is the process of developing through a series of progressive experiences an ability on the part of the learner to do something that he could not do before. This excellent definition focuses attention on the phrase "series of progressive experiences" which largely describes the difference between modern scientific training methods and the haphazard efforts which characterized the programs of yesterday. It substitutes a series of "experiences" or jobs carefully graded in difficulty, a regular course of study as it were, for the miscellaneous small jobs arising out of production expediency which were not far removed from actual exploitation. To en-

Block No. 1 SKELETON LESSON PLAN Lesson No. 1

TEACHING UNIT: DRILL PRESS

Rough drilling to punch marks within 1/32"

Primary or Secondary:

STEP 1—PREPARATION:

Idea 1 A drill

2 A drill press

3

4

5

J. O. P.: Holes are rapidly bored in a solid body by a revolving drill under pressure.

STEP 2—PRESENTATION:

Point 1 Fasten job firmly to table.

2 Fasten proper size drill in spindle.

3 Set point of drill to center of punch mark.

4 Set machine for proper speed and feed.

5 Start machine

6 Apply feed.

7 Release feed and withdraw drill

8 Stop machine.

TYPE JOBS
1. Foundation Blocks
2. Test Plates
3. Angle Clips
4. Flanges
5. Manhole Covers
6. Retaining Rings
7. Dog Handles
8. Name Plates
9. Levers
10. Hinges

Block No. 1 AUXILIARY INFORMATION (STEP 2—PRESENTATION) Lesson No. 1

Teaching Point	TRADE TERMS	SAFETY	CARE OF TOOLS, ETC.	SCIENCE	STOCK
1	Table	Be sure job is	Proper clamp-	Locating work	
	Clamps	securely	ing.	on table	
	T-Slot	fastened. Use	Proper		
	Trench	proper size	clearance.		
	Packing	wrench			
2	Burr	Drill and	Never use	Determining	
	Spindle	socket must	hammer on	proper size	
	Socket	be tight in	sockets or	of drill	
	Drill Shank	spindle	drill		
	Tang				
3	Punch mark		Do not jam	Set rail for	
	Drill point		drill down	proper spindle	
	Center		on work so as	travel.	
	Cutting edge		to destroy cutting edge of drill	Proper location of drill	
4	Feeds	Don't change	Keep machine		Different
	Speeds	belt with	well oiled.		kinds of
	Belt	machine in	Don't shift		materials
	Pulley	motion	feed gears		require dif-
	Gears		with machine in motion		ferent speeds and feeds
5	Starter button	See that drill is clear			
6	Feed lever	Keep hands	Keep drill	If hand feed	
	Cutting compound	clear of drill	lubricated. Don't drill into table.	is used, be careful of amount of pressure applied	
7	Burrs				
8					

A lesson in drilling. Every phase of the work is included and the apprentice must complete each acceptably before he passes to the next

trust an apprentice with a really worthwhile job was unheard of in the old days, and yet it was expected of him as a journeyman that he not only accept, but hold up his end in production on any job passing through the shop. The inconsistency of such a system is apparent at a glance, and is the sub-conscious basis for much of the former condemnation of apprenticeship.

A careful analysis of any craft will reveal two surprisingly simple facts which must underlie the projected "series of experiences," or courses of study. In the first place the mechanic, regardless of his particular craft, performs only a very few fundamental operations. These fundamental operations, however, are spread over many variations of machines, or materials, or products. By way of illustration, the fundamental operations performed by the machinist are five in number, viz.:

1. Laying out the job.
2. Clamping up the job.
3. Removing metal from the job.
4. Taking accurate measurements from the job.
5. Assembling the job.

He unconsciously passes from one to the other, hundreds of times daily without recognizing the divisions of effort, and yet these are the things he is paid to perform in an expert manner. Fortunately the variations are readily distinguishable in a machine shop, and will embrace each type of machine in turn, beginning with the simplest to operate and extending through the most complex. The following would be a satisfactory order for the average shop:

1. Drill Press
2. Shaper
3. Slotter
4. Planer
5. Turret Lathe
6. Horizontal Boring Mill
7. Vertical Boring Mill
8. Bench and Floor
9. Lay Out
10. Milling Machine
11. Lathe
12. General Shop Experience

The general plan of training then, embraces teaching five fundamental processes in eleven variations, beginning with the drill press and ending with the lathe.

Each machine will next be considered in turn to develop its possibilities, beginning as usual with the simplest possible operation and ending with the most involved and difficult. These possibilities will be described step by step in general terms, thus:

Machine: *Drill Press*

Class 1. Rough drilling and countersinking to punch mark, location approximate, open holes in comparatively thin stock.

Class 2. Drilling open holes of one size, holes accurately located with regard to each other. Use of plate jig.

Class 3. Drilling open holes of same size, accurately located with reference to each other and to job as a whole.

Class 4. Drilling holes of different sizes, accurately located and spaced, including heavy work involving use of back gears. Ordinary or multiple drill press.

And so forth, through all eleven variations, which will be listed in order on a "Progress Chart."

Just what, in the way of increase in manual skill and trade knowledge, differentiates the Class 2 jobs from Class 1? Class 3 from Class 2, etc.? Whatever it may

be must be carefully dissected and incorporated in lesson form. Perhaps new trade terms must be explained; here a safety point is necessary; there a knowledge of stock is needed. It may be that mathematical computations, or a phenomenon in physics or chemistry must be explained. Care of tools and equipment must be emphasized at various points. All of this and more is classed as auxiliary information, and suitable provision must be made for the instruction of the learner in these items if the job of training is to be completely done. Perhaps the best method is found in the use of skeleton lesson sheets which the instructor will work up and which will incorporate in outline at least a memo of each instruction item in order that nothing shall be omitted from the lesson.

The skillful instructor will give much thought to the manner in which he will lead up to the new lesson, the teaching step known as "preparation"—preparing the learner's mind for the new subject. The more appropriate and striking the approach, the easier and more thorough the comprehension of the learner. In this step it is often very desirable to explain the "why" of a process or operation in simple, logical sequence of ideas, gradually leading up to the point where the new process will be demonstrated to and tried by the learner step by step, the portion of the lesson technically known as "presentation." A careful approach in the hands of a competent instructor will greatly reduce learning time as well as provide a never-to-be-forgotten story for the boy. In all this we are only following the law of learning, which teaches that learning is not continuous, but a series of steps alternating with periods of absorption.

ALL that now remains is to select a number of jobs from regular production which exemplify the difficulties embraced in each of the classes, and append these "type jobs" as they are called to their respective lesson sheets. The longer the list of suitable type jobs for each lesson the better, as a large variety will almost insure that a suitable job will be at hand when needed. It is unnecessary to add that the apprentice is kept working on a given class of work until he becomes thoroughly proficient, but no longer. To extend his training beyond the needs of proficiency needlessly prolongs his training.

The simplicity and certainty of such a method is remarkable. The instructor observes that apprentice John Doe has become proficient in the work of Class 4 on the drill press. He notes this fact against John Doe's name on the progress chart which hangs on the wall in a prominent place in the shop. Referring to his book of skeleton lesson sheets, he finds from the "type jobs" appended to the next lesson that he will need jobs of a certain kind for this lesson. These he selects from current production and arranges for delivery at John Doe's machine. A few minutes with his lesson sheet refreshes his memory with the outline he is to follow as well as the details of auxiliary information, armed with which he approaches the boy and puts over an effective lesson in an effective manner. The instructor demonstrates; the learner tries; the instructor corrects; the learner tries again. In a surprisingly short while apprentice John Doe is doing acceptable work, and the instructor is free to devote his time to other duties, maintaining only nominal supervision over the now busy and interested apprentice. How easy it is to train the hand!

How the heads and hearts of Newport News apprentices are dealt with will be told next week.

· BOOK · REVIEWS ·

AN AUDIT OF AMERICA. *By Edward Eyre Hunt. Two hundred three pages, 5x8 in. Cloth Boards. Published by the McGraw-Hill Book Company, Inc., 370 Seventh Ave., New York, N. Y. Price $2.00.*

MR. HUNT'S book is an able summary of the monumental, two volume "Recent Economic Changes in the United States," prepared for a committee of the President's Conference on unemployment and published in May, 1929. This report made public the committee's conclusions based upon the findings of a special staff of the National Bureau of Economic Research.

Here then, in abridged form, is found the meat of the larger work, interestingly written, and clearly printed. Chapters include, The Consumer and His Standard of Living, How Industry is Changing, Construction as a Balance Wheel, Railways and Ships, Changes in Marketing, How Labor is Faring, Changes in Management, Credit and Money Movement. All in all it is a compact presentation of the basic facts underlying, the structure of American business. It is highly to be recommended to American business and manufacturing men.

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THE TECHNIQUE OF EXECUTIVE CONTROL. *By Erwin Haskell Schell, Professor of Business Management, Massachusetts Institute of Technology. One hundred seventy-one 4¾x7¼-in. pages. Indexed. Published by the McGraw-Hill Book Company, 370 Seventh Ave., New York, N. Y. Price $2.00.*

THIS is the third edition of this work, originally published in 1924. The author deals in an analytical way with those qualities an executive should strive to develop in himself and in those over whom he has supervision. He discusses means through which the executive should exercise his authority, difficulties which may arise, and ways of overcoming these difficulties.

Professor Schell develops his subject by attempting to stimulate his reader's train of thought rather than by the presentation of rigid formulas. Toward this end, he employs a number of problems interspersed throughout the text. In this third edition, a series of questions has been added to each problem to direct the reader's mind into new angles in its consideration.

*

PROCEEDINGS OF THE 17TH ANNUAL CONVENTION OF THE AMERICAN RAILWAY TOOL FOREMAN'S ASSOCIATION. This 144-page booklet, bound in flexible, imitation-leather covers, is the edited stenographic report of the convention held in Chicago, Sept. 11-13, 1929. It includes reports of all committees, such as those on standardization of boiler tools, methods and tools for repairs to air brakes, jigs and devices for the locomotive shop, and on tools and equipment for car repair shops. Addresses by the officers of the association and by leading mechanical railway executives are also included. Lists of members of the association, their officers, exhibitors at the convention, and the by-laws are appended. Issued by the secretary, 11402 Calumet Ave., Chicago. Price $2.50.

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions given at the foot of the page have been prepared

THE · FOREMAN'S

Government Work

ED HAD nearly reached the gate in front of his home, where Al stood waiting, when his wife opened the front door and called to him, "Here Ed! I knew you'd forget this burner if I didn't keep right after you every minute. Don't forget to bring it home with you tonight."

"All right, I won't," replied Ed. "Goodbye."

"Trying to get out of doing a job, eh? You can't shirk on friend wife and get away with it," said Al.

"I'm not trying to. I merely forgot it—and I wish she had. Does your wife ask you if you can't take everything from the clock to the gas range down to the shop and have it fixed? They seem to think that's all the shop is for."

"Sure, the economical ones do that. The others buy new ones. Take your choice. But what are you looking so sour about?"

"Oh, darn a woman anyway. Yesterday I called Ralph Morrison down and told him not to bring any more household trinkets around to repair on the company's time, and here the wife loads this thing on me."

"Why worry? My men often bring some of the home furnishings around to repair, but I don't see them until they carry it too far."

"That's just it. Some of them do carry it too far, and if you let them get by with it—well, they take it for granted that it's O.K. and bring something else. I have some men who bring in an occasional job and work on it during the noon hour. I had one fellow that used to repair automobile parts for other people during the noon hour. I sat on that promptly."

"I don't blame you in that case. Personally, I draw the line on a man doing machine work during the noon hour. I don't mind vise work, and I'll even let a drill press hand do a short job for anyone, but no machine work."

"Why can't we take such jobs and make out a time card against them? We do that for office people on anything over half an hour?"

"For several reasons Ed. In the first place, our conscience will always allow us to do for others what we won't do for ourselves. Second, we can't do it for the same reason that makes us burn our scrap lumber instead of giving it away. There's always someone ready to spoil a good thing. Finally, the cost department says it would cause too much bookkeeping and collecting. For goodness sake, quit worrying about it. Let the shopmen have one little advantage, but keep it within bounds."

"You're no help. I wanted to be able to tell the wife that it would cost more to fix it than it would to buy a new one."

What is a reasonable charge for personal work? To what extent should it be allowed?

Contributed by W. J. Owens, Foreman, Newport Rolling Mill Company

Foremen are invited to discuss these questions vital to their work; of course the

ROUND · TABLE

DISCUSSION OF EARLIER TOPICS

The Ethics of Making a Change

THERE are three points of ethics for one to consider when contemplating a change of jobs: loyalty to the present employer, consideration for the prospective employer, and respect for oneself.

A man's loyalty is frequently based upon the treatment he has received. A company which refuses to give raises except as inducements to prevent men leaving, must expect many to obtain promises of new jobs merely for the sake of holding up the company for a raise. However, if the employer has always been fair, a reasonable man will want to reciprocate. A thoughtful foreman will be interested in how successful his job is going to be after he leaves it, so he will not be troubled in conscience if he feels that he has done his best and can drop the work in such shape that an equally capable man can easily pick it up.

Consideration for a prospective employer is not shown when a man goes through all the motions of taking a new job and then repudiates it all by taking a raise on the old job. No executive wants to be an accessory to the hold up of another. A man who makes a practice of this trick will soon find himself unable to obtain consideration from prospective employers. Therefore, it is important that one should prepare for a possible inducement to keep an old job, before making an agreement for a new job.

In making his decision he should weigh against the money consideration such items as possibility of keeping the new job, chances of liking it, opportunities for gaining valuable experience, opportunities for self improvement and for advancement.

—HARRISON G. BROWN, *Standards Engineer, Crompton & Knowles Loom Works.*

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Why Conferences, Anyway?

THE main trouble with committees and conferences is that the enthusiasm attendant upon the first meeting soon dwindles and they become passive rather than active. How many of us have been on committees that have started off strong and full of determination to carry on, only to find that after one or two meetings the interest commenced to lag? This appears to be particularly true when the management is not represented in some manner.

Most committees appear to be composed of at least one good sound thinker, who studies the problem and who can express his views in a clear, logical manner; one talker, who looks over the situation superficially and argues about it anyway; and the balance generally all "yes" men.

The committee meets and the various members size up the situation and mentally concede the leadership to the sound thinker, and the talker, after which they leave the two to dig up the facts and argue them out while they form their opinions from the arguments presented, and then "holler" after the meeting that the two men who had done all the work ran the meeting to suit themselves.

In order that shop committees may remain active, it is best to have a representative of the management, who understands the plant conditions generally, to act as mediator merely in order to keep the ball rolling.

The mediator must be diplomat enough to stop, or curb excess discussion. It is evident that no problem can receive sufficient consideration if the essence of the problem is lost in verbiage. The bad feature about unlimited discussion is that the point in issue is lost and some minor detail is stressed with the result that the committee's action really amounts to so much lost time.

—CHARLES H. RICHARDS.

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Advising Employees About Their Affairs

ALL IS at fault in firing a man before he has considered all the angles of the case. These angles could have been brought out by a tempered reprimand accompanied by a question as to why the man's mind appeared to be preoccupied.

Any good man is likely to have personal trouble at some time, and the less he has had previously, the more it is apt to trouble him. Then is the time he needs a boost most; certainly not a kick. If a man has his own troubles well in hand, then by all means avoid giving any advice, or you will be termed an objectionable busybody. The foreman who compared his job to that of a parent having a lot of lovable, unruly youngsters, who is seeking to steer them along the right course and never prying into their private affairs, will gain a reputation for fairness and square dealing that will greatly assist in having his decisions respected and supported.

If the foreman will sell himself on the idea that he is working in the interests of justice and mankind in general, but at the same time remembering that none of the workers are obligated in the least to follow his advice, the plan will have greater success.

—F. L. INGLERIGHT, *Shop Superintendent, Bradford Motor Works.*

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New Drills and Old Men

AS A TIME-STUDY engineer for a number of years I was able to obtain a thorough understanding of what is required to handle old men when new machines are to be brought into play. I would call the handling of our workers in the many industries, "Human engineering." In a plant where the men are treated as human beings, the greatest efficiency is to be found. I've encountered all types of men, some who were ready to

discussion is not limited to foremen. Letters accepted and published will be paid for

fight if you attempted to change their method of performing an operation, and others who were directly opposite, susceptible to any new idea, and ready to give any worthwhile thought a chance. In handling a man like Bill Jackson, the first thing to do would be to find a friendly rival looking for an opportunity to demonstrate his ability. The next thing would be to teach this man the rudiments of the machine tool, and then to place him on the job, offering him every incentive possible. After a short time the willing man would be turning out a greater amount of work than Bill Jackson, and the latter would gradually see the light and ask for a chance to try the new equipment himself. Coming around in this manner, he would make every effort to better the output of his opponent. —FREDERICK SCHMIDT.

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Who Shall Be Laid Off First?

DURING rush periods the tendency is to hire both skilled and unskilled men, as the opinion seems to be that a poor man is better than no man at all; and there is always a possibility of making a good man out of a poor one. Then, when the dull period sets in, the weeding out process begins and the unskilled man goes. Soon the point is reached where it is merely a question of ability. Naturally, it is advantageous for the company to retain its most capable men as a nucleus for another organzation when business becomes better.

Short time is unsatisfactory to the men. Of course there are times when it must be resorted to, yet it is better to reduce the force and keep the good men than to hold a large force, work them short time, and take a chance of having them leave for another job.

—P. H. PEARSON, *Foreman, B. F. Sturtevant Company.*

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The Ethics of Making a Change

THE offer for another position should be taken up with the management in the same manner as any other business contact occurring during the course of regular business. Of course, this is not an everyday occurrence, and the man who has had such an offer, may feel nervous about bringing it up. As a consequence, instead of openly discussing it as he planned, he may merely blurt out an ultimatum. To circumvent this, the employee should always remember that, while it is unusual in his experience, the superintendent or other executive of a large organization has had to, and still expects to, meet this problem from time to time.

The essence of the situation is fair play, an open mind, and all the cards on the table. If the employee has already determined to go, and does not want to discuss it in detail, which is the exception, he should clearly state so. Otherwise, he should concisely outline his position, holding back none of the thoughts or reactions he has to the situation. Given such a tangible foundation upon which to build, the vast majority of executives will give a fair analysis of the situation as they see it.

Satisfaction with the present job is assuredly worth something, and money is not the sole consideration. When a man is approached for prospective employment, it is natural to paint the picture in its brightest colors, with the dark spots omitted. It is a truism that the grass always looks greenest on the other side of the fence. A reasonable survey of the new job will disclose to the common sense of the prospect whether the new job, as painted, really warrants the increase offered, and whether it is comparable in salary to similar jobs in other concerns. If the salary seems unduly high on such comparisons, caution is needed, for it may represent only an emergency to be met, information of a special nature to be worked out of the prospect during a limited period, or desperate circumstances to be met with heroic measures until normalized.

Discontent is a sign of irritation and not ambition. The ambitious man is following a definite scheme for his own improvement, confident of his ultimate success, and reasonable enough in his attitude to realize that success can't be scheduled like a production job in the shop. If he feels he is not going ahead fast enough, he looks first to himself, then to general business conditions, and lastly considers the need for a change. Discontent doesn't enter into it, for the ambitious man realizes that it gets him nothing, and adds but another handicap to be overcome.

—ELI SMITH, *Engineer, Russell Company.*

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Too Much Co-operation

WHETHER the average executive co-ordinates or merely arbitrates is difficult to decide. Probably he combines both in varying proportions. Certainly an executive with strong constructive leadership will be unsatisfied with such a static, hand-to-mouth policy as mere arbitration. He will strive to knit his men together into an organization of good fellowship, good will, and mutual helpfulness, so that disputes and deadlocks shall not arise for arbitration.

Arbitration decides disputes for the moment. The disputants are dissatisfied, and frequently, in deadlock again soon after, requiring further arbitration. The relations of capital and labor in Australia are a striking illustration of this on a large scale. Arbitration has been habitual there. Dispute and deadlock have followed each other in wearying and wasteful repetition.

Co-ordination—regulation and combination in harmonious action—is the distinguishing characteristic of a first class executive. With foresight he will ever build to that achievement. Today's settlement alone will not content him; he will also require the future's firm foundation.

Can the average man be a good fellow and a good foreman at the same time? To be a good foreman he will have to be a good fellow. A good foreman who is not a good fellow needs abilities far above those of the average man to compensate for his lack of good fellowship.

—J. J. WOFFINGTON, *Warwickshire, England.*

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THE · NEXT · TOPIC

"Quality or Quantity?"

Trimming Time in TRIMMING PLATES

A REAL innovation in the design of the larger sizes of metal-working machinery is rare. We have become quite accustomed to descriptions of machine tools of larger size than have heretofore been built; precision requirements thought impossible a few years back are being met by the heaviest classes of machines; new control devices make possible the easy and rapid operation of the most massive equipment. Invariably, however, machines incorporating these improvements are based in principle on older designs performing similar operations.

A plate-trimming machine just completed by William Sellers & Company, Philadelphia, Pa., not only embodies advances in capacity, speed, and control but utilizes a novel method of cutting as well. A planing operation, which removed metal by successive strokes of a tool fed inward from the edge of the plate, was formerly employed by machines used for this service. Sellers' machine cuts upward and downward from both surfaces of the plate simultaneously, making cutting time independent of the width of stock to be removed. Both edges of the plate are entirely finished with one pass of the machine. The return stroke ejects the completed plate and pulls a new one into place.

This machine was built to meet the demand for a more efficient method of trimming plate for the manufacture of welded steel pipe used in natural gas and oil lines. It receives steel plates directly from the rolling mill and prepares them for subsequent operations. Plates 50 ft. in length, 31 to 55 in. in width, and up to $\frac{1}{2}$ in. in thickness can be handled.

Each edge of the plate is machined by two tool manifolds, one above and one below the work. Each manifold carries sixteen tool bits so arranged that successively narrower and deeper cuts are taken. The inner faces of the tools are held in alignment to square the trimmed edge. The tools in the upper manifolds are staggered with those in the lower, the last two overlapping slightly,

to part the plate completely. The strips which have been cut from the plates are pushed off the machine by twelve pneumatic cylinders. These strips slide down sheet-metal plates, clear of the screws and ways, to a belt conveyor. They are carried to chopping machines where they are cut into short pieces and emptied into buckets for disposal.

The front ends of each pair of manifolds form a tapered slot which guides the plate and smooths out irregularities. The tools may be adjusted by means of setscrews and are held in place by a steel gib with clamping bolts between each pair of bits. Cutting speeds may be varied from 30 to 75 ft. per minute with a maximum return of 90 ft. per minute.

Two traveling saddles, mounted on ways faced with hardened and ground steel plates, carry the tool manifolds. They are driven along the bed by screws engaging 100-deg. bronze nut segments, 36 in. in length. These screws presented a manufacturing problem in themselves as they are 67½ ft. in length, with 59 ft. of thread, 6$\frac{13}{16}$ in. in diameter, 6 threads, 7½ pitch. Their thrust is taken by special Rollway thrust bearings. Each screw is supported throughout its full length by bronze half bushings bolted to the bed. An operator's work platform is mounted on each saddle.

The prime mover is a 250-hp. Westinghouse, d.c., three-to-one motor equipped with a Cutler-Hammer reversing motor controller. A series of trolley wires, strung along the right-hand side of the machine, provides means of machine operation from the work platform on the saddle. A flexible coupling connects the motor to a herringbone gear reduction, which in turn drives a set of spur gears, keyed to the ends of the saddle screws. The driving shafts are mounted on S.K.F. ball bearings.

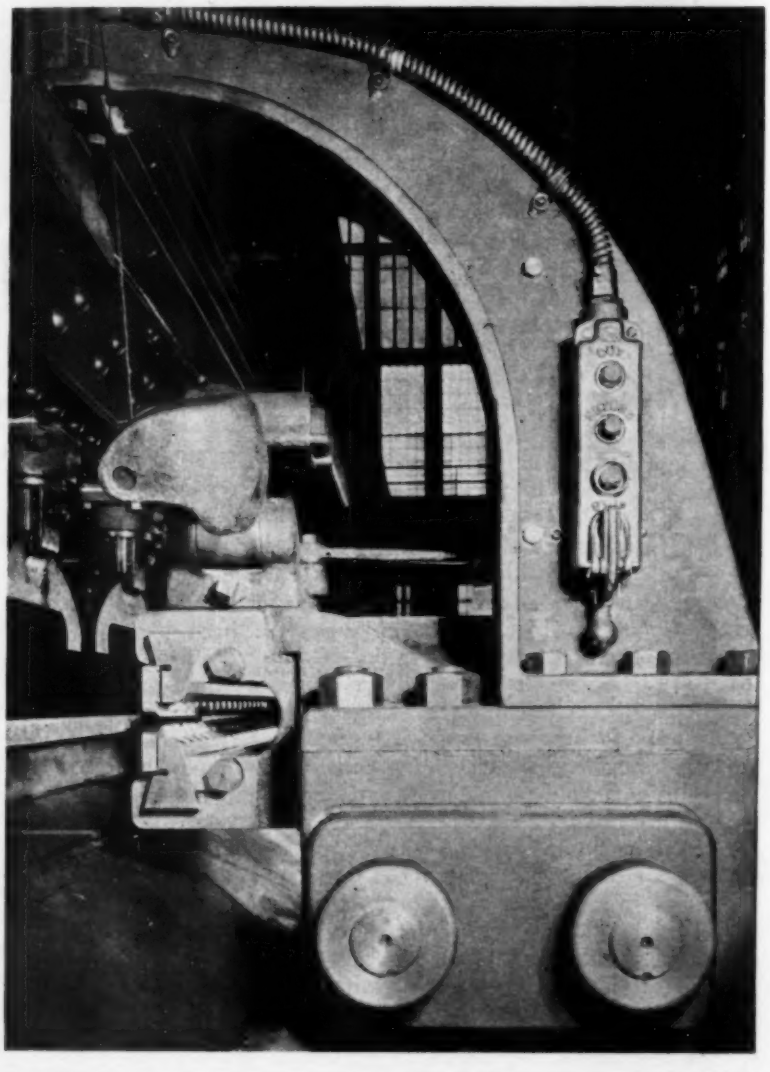
A WORK supply table holds a number of plates at the head end of the machine. Large holes cored in the end housings permit the longitudinal passage of the plates. At the completion of each cut, one of these plates is pushed up to the ends of the saddles, where it is gripped by special attachments, operated by a lever and cam. These grippers may be swung upward out of the way when the tool manifolds are removed. At the opposite ends of the saddles, are located push-off stops, which the operators control from the work platforms by means of a rack and pinion. On the return stroke, the saddles push the trimmed plate out of the tail end of the machine and simultaneously pull another into position.

The central work supports are fixed, but the outer ones are adjustable laterally to accommodate plates of various widths. To facilitate sliding the plates over these supports, when loading and unloading, a series of 52 steel balls are provided which extend slightly above the surface of the supports where they are held by springs. The point contacts, thus provided, reduce greatly the sliding friction between work and supports.

Spring-actuated kick-up stops are held below the surface of the head end supports when a new plate is being loaded. When the weight is removed, these latches are forced upward and abut the plate to resist the cutting pressure.

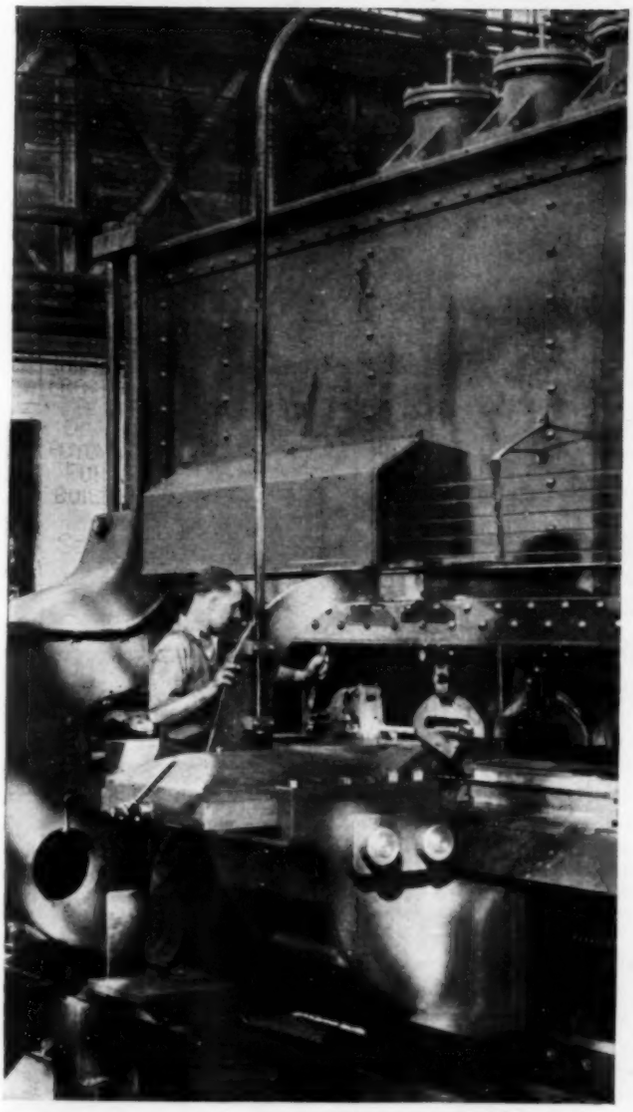
FIFTY 5,000-lb. pneumatic jacks, in two rows, hold the work in place during the cut. When clamping pressure is applied, the steel balls are pushed below the surface of the supports, allowing the plates to rest directly on the castings. The jacks are mounted in a heavy, fabricated steel bridge with a vertical section 6 ft. in depth and 65 ft. in length. They may be controlled from any one of four stations within reach of the operator on the left saddle work platform. The clamping pressure may be relieved and the jacks elevated in seven seconds. Each jack carries a two-point adjustable clamp which may be revolved to suit the width of the plate and which is pivoted to equalize the clamping pressure.

Oil is continuously fed to all bearings by a rotary pump, geared direct to the armature shaft of the driving motor. Brass pipes, running the full length of the bed



Shark-like teeth to bite half inch steel plate

An archway to fast production



From his station on the reciprocating tool saddle, the operator controls his mammoth charge

on each side, supply oil to the upper saddle gibs at short intervals. This oil flows down to the trough formed by the driving screw bearings and overflows to the lower saddle ways. It is then returned to a twenty-gallon reservoir by pipe lines. Oil is cleaned by a purolator in the supply line and strainers in the return lines.

The entire machine is 74 ft. 4 in. long, 13 ft. 2 in. in height, and weighs 315,000 lb. It is one of two identical units being built for the Republic Iron and Steel Company of Youngstown, Ohio. A third machine, similar in design, but accommodating wider plates, and driven by two 150-hp. motors, is in process for the National Tube Company.

Using Blind Ads—*Discussion*

By L. F. Swenson
Industrial Engineer, Perkins Machine & Gear Company

THE USE of blind advertisements is fully established, and no amount of citing examples, as done by Charles R. Whitehouse in his article on page 248, Vol. 72, of the *American Machinist*, will change the practice.

It is admitted that the employer has an advantage when seeking men by this method, but he is to be satisfied in the first analysis. The responses to his advertisement will be, in both quantity and quality, in direct proportion to the clearness of the advertisement. Applicants will naturally word their letters to make a good impression, based on the ideas conveyed to them by the advertisement. Thus the burden is put upon the employer, where it has belonged from the very beginning.

When the letters come in, he must sort out the ones that are not to be considered further. The remaining letter should be answered directly and forms sent to the applicants on which they are to enter definite information. Upon the return of these forms and after studying the information contained therein, the employer should ask the man whom he thinks will best answer his requirements to come on for an interview, with all expenses paid. If other applicants are called for interviews, they should be treated in the same manner. When the position is filled, a short letter should be sent to each unsuccessful applicant, telling him of the fact.

But little criticism could be made if all advertisements were good ones; applicants notified when the position was filled; and the practice of giving the name of the state where the business is located, as is done in the *American Machinist*, was more universal.

Our Changing Exports

By S. R. MARCH

Industrial Machinery Division, Bureau of Foreign & Domestic Commerce

STATISTICS which have just become available indicate how United States exports of industrial machinery—now valued at more than a quarter of a billion dollars and representing the greatest volume of any year since 1921—were absorbed. The information has been awaited with special interest by American machine-tool dealers because of the efforts of many countries to cut down imports and build up their domestic industries, the increasing competition between world suppliers of industrial machinery, the pressure for long-term credits and price cutting, and the well-known fact that American machinery continues to sell on a quality rather than on a price basis, and upon the strictest payment terms. These considerations, coupled with the fact that the American product is produced by the highest paid labor in the world and commands the highest prices in world markets, make an analysis of these export returns of unusual importance.

Europe, aided by the best year it has enjoyed since the World War, held first place as a market for American industrial machinery, surpassing all Latin America in this respect for the second consecutive year, despite the fact that shipments to Latin America were the largest in many years. Exports to Europe, as shown in the accompanying table, were valued at $78,800,000, and represented a 23 per cent increase over the 1928 total, which was, in turn, the largest since the immediate post-war years.

This substantial growth in sales to the world's most highly competitive markets is significant in view of the questions raised from time to time regarding the ability of the American product to compete effectively with lower-priced foreign machinery. It is true, however, that this trade was largely in highly improved specialized machinery, for the European demand for the simpler types of general-purpose equipment is being supplied by domestic manufacturers. Nearly one-third of the total shipments to Europe consisted of metal-working machinery, almost all of it of the latest high-production types.

Shipments to all of the principal market areas of the world showed substantial increases and were the largest in many years, with the single exception of those to the West Indies. Canada, including Newfoundland and Labrador, with the urgent requirements of a pioneer country, continued to absorb an increasing volume of machinery. Metal-working machinery, and construction and conveying machinery, were the two leading items in this trade, shipments in each group exceeding $8,000,000 in value, although power-generating, textile, sewing, and shoe machinery shared well.

Trade with South America, Mexico and Central America, and the West Indies moved upward, despite adverse conditions in several countries in the area. Some light will be thrown on the nature of this trade in the subsequent discussion of shipments to individual countries. The largest proportion of the exports was in mining, oil-well, and pumping machinery.

Exports to Asia, Australasia, and Africa exceeded those of any recent years, and indicate that the industrialization of these countries, which received a temporary set-back immediately following the war, is now proceeding on a more normal basis. Table I compares United States exports of industrial machinery during recent years by principal market groups.

The trade with Soviet Russia in Europe and with France was probably the most interesting feature of the year. Within the short space of four years, Russia has moved from twelfth to third largest customer of the United States, the gain for the years 1927 and 1928 being approximately $2,000,000 each year, while that for 1929 was in excess of $5,000,000. It must be borne in mind, however, that this trade has been stimulated by Russia's ambitious industrial plans and cannot be taken as an indication of a normal or permanent expansion. This trade is now abnormally large as a result of Russia's Five-Year Industrial Plan which took

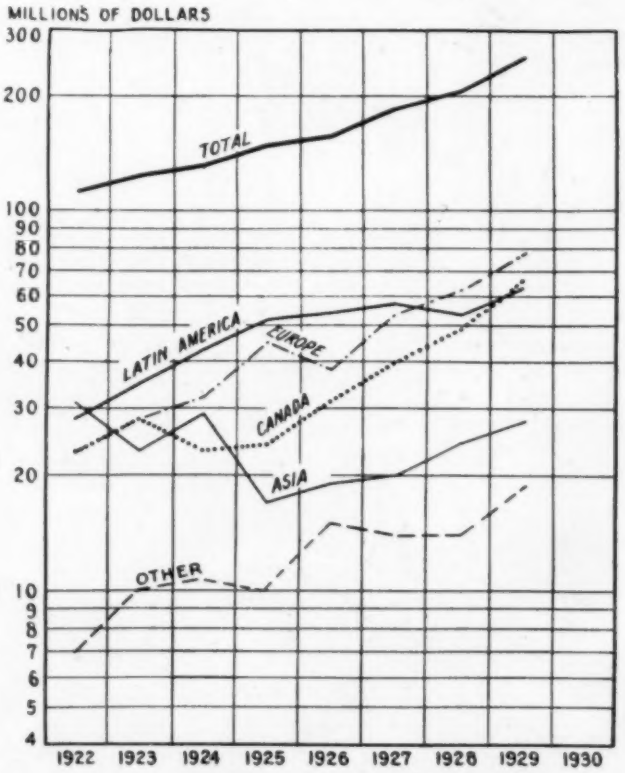


Fig. 1—Changes in the destination of United States industrial machinery exports

effect with the fiscal year 1928-29. Shipments to Russia have consisted mainly of metal-working, oil-well, and oil refining machinery.

Shipments to France showed a sharp gain, despite the fact that France has at her command the very convenient "deliveries in kind" system of obtaining her machinery

requirements from Germany, whereby they are charged to reparations account. More than half of the trade with France was in metal-working machinery, a fact which may be accounted for largely by retooling operations on the part of the leading French automobile manufacturers and also by the establishment of American branch factories. Exports to the United Kingdom were the largest in many years, consisting mainly of metal-working machinery, followed by textile machinery and industrial sewing machines.

Among the other European countries which showed substantial increases in their imports from us were Germany, Spain, Italy, and Sweden. In the Balkans, Greece and Rumania made outstanding gains, the trade of the former amounting to more than two and one-half times that of 1928. The important construction, irrigation, and drainage work which American firms are carrying out in Greece probably accounted for this large increase, as construction and conveying machinery made up more than half of the total machinery trade. Of the shipments to Roumania, nearly two-thirds consisted of oil-well and oil refining machinery for the oil industry there.

Table II compares foreign markets for American industrial machinery according to the volume of exports in 1929.

Table II—Comparative Value of the Foreign Markets for American Industrial Machinery Exports

Country of Destination	Rank	1926	Rank	1927	Rank	1928	Rank	1929
Canada	1	$30,850,429	1	$38,380,941	1	$49,221,231	1	$65,657,691
United Kingdom	2	18,395,212	2	25,048,034	2	24,434,630	2	26,538,061
Soviet Russia in Europe	12	4,114,946	10	6,580,346	6	8,406,436	3	13,737,779
Mexico	3	9,758,431	3	9,176,395	3	10,010,900	4	12,327,459
France	10	4,418,786	12	4,821,147	4	8,697,575	5	12,065,549
Argentina	8	5,863,358	6	7,049,837	5	8,522,463	6	8,986,441
Venezuela	4	7,784,119	5	7,411,590	8	6,373,066	7	8,309,684
Japan	6	7,215,679	9	6,608,655	7	7,468,635	8	8,050,989
Germany	15	3,197,895	7	6,874,638	9	6,297,528	9	7,092,520
Australia	7	6,151,717	8	6,863,377	10	5,574,536	10	6,710,519
Brazil	13	3,969,833	11	5,031,311	11	5,391,267	11	6,362,846
Netherlands East Indies	17	3,028,716	18	2,886,993	16	3,546,726	12	5,964,823
Chile	5	7,588,810	13	4,729,767	19	2,824,417	13	5,625,673
Cuba	9	5,614,717	4	8,170,799	12	5,160,060	14	4,434,439
British India	16	3,160,834	15	3,940,719	15	3,623,773	15	4,067,382
Philippine Islands	21	1,890,146	19	2,761,229	13	4,617,510	16	4,056,533
Italy	19	2,013,736	21	1,841,895	20	2,618,479	17	3,905,280
British South Africa	18	3,022,607	16	3,191,765	17	3,280,716	18	3,889,262
Spain	22	1,384,222	20	2,200,502	18	3,007,157	19	3,750,142
Netherlands West Indies	46	225,690	38	461,384	25	1,717,158	20	3,590,002
Colombia	11	4,178,257	14	4,405,082	14	4,332,546	21	3,567,441
Roumania	23	1,318,275	33	865,637	23	2,099,893	22	3,285,873
Belgium	25	1,020,877	28	927,172	22	2,119,823	23	2,517,663
Peru	14	3,494,439	17	2,965,207	21	2,280,962	24	2,485,691
China	20	1,979,881	27	1,024,288	24	1,885,193	25	2,253,894
Sweden	27	847,506	23	1,157,009	27	1,327,822	26	2,135,467
Netherlands	29	656,016	24	1,108,902	28	1,311,733	27	1,805,901
British Malaya	26	961,346	22	1,283,560	29	1,238,026	28	1,775,408
Uruguay	34	565,152	29	912,782	32	966,400	29	1,457,870
New Zeland	24	1,220,048	26	1,024,657	34	833,960	30	1,300,934
Newfoundland and Labrador	47	220,710	35	581,219	42	494,576	31	1,167,370
Panama	31	600,436	32	888,920	30	1,213,419	32	1,137,819
Trinidad and Tobago	33	580,209	25	1,068,894	36	629,758	33	1,124,975
Bolivia	28	684,127	34	679,090	31	974,301	34	994,432
Czechoslovakia	56	152,789	49	224,367	33	950,536	35	863,065
Kwantung	45	231,652	36	523,228	44	469,151	36	820,872
Switzerland	48	207,229	41	362,424	43	483,333	37	799,133
Norway	36	474,528	37	466,734	39	541,213	38	796,549
Portuguese Africa	32	585,127	30	911,020	41	501,253	39	761,385
Soviet Russia in Asia	35	522,766	54	145,416	45	448,440	40	708,366
Greece	41	289,783	51	199,758	55	242,210	41	628,204
Denmark	40	304,979	40	412,574	40	505,295	42	590,261
Poland and Dantzig	42	277,098	42	339,466	48	413,522	43	547,535
Dominican Republic	30	647,276	31	910,245	35	733,158	44	455,959
Finland	39	358,285	45	318,724	46	422,633	45	425,123
Ecuador	49	204,274	46	292,073	37	575,204	46	423,419
Honduras	51	193,162	47	278,837	47	413,593	47	371,644
Costa Rica	55	154,487	52	181,863	54	266,602	48	368,520
Salvador	37	408,203	43	324,687	38	557,192	49	335,626
Guatemala	38	373,035	39	417,156	51	328,191	50	329,432
Hongkong	57	136,165	44	321,634	49	369,708	51	285,022
Nicaragua	50	195,223	50	215,422	53	267,566	52	255,042
Irish Free State	(1)	(1)	..	.....	26	1,644,814	53	237,826
Haiti	53	159,182	48	276,648	52	273,193	54	191,497
Total, including other countries		$156,604,926		$183,168,687		$206,211,738		$257,085,110

(1) Not separately classified.

Of the South American countries, Chile led in increased machinery purchases, imports being double those of the off-year 1928. This sharp upturn in trade was doubtless the combined result of a banner nitrate year, an extensive public works program (especially in central and southern Chile) and active manufacturing.

The serious coffee crisis in Brazil did not occur until the latter part of 1929 and therefore came too late to prevent a gain of nearly 20 per cent in the total industrial machinery imports. The largest classified item entering into this trade was construction and conveying machinery, a substantial portion of which was probably destined for American branch plants erected in 1929.

TABLE I—UNITED STATES EXPORTS OF INDUSTRIAL MACHINERY BY PRINCIPAL MARKET GROUPS

(Thousands of Dollars)

	1924	1925	1926	1927	1928	1929
Canada, Newfoundland, etc	23,297	24,134	31,072	39,000	49,727	66,867
Europe (except Balkans)	32,159	45,688	38,342	53,225	63,830	78,787
South America	19,247	26,328	34,685	33,685	32,427	38,465
Mexico and Central Amer.	11,524	13,005	11,721	11,527	13,302	15,184
West Indies	12,701	13,100	7,561	11,345	8,965	10,255
Total Latin America	43,472	52,433	53,967	56,557	54,494	63,904
Asia, (except Near East)	21,826	16,582	19,249	19,740	24,024	28,381
Australasia	5,774	6,039	7,425	7,928	6,460	8,085
Africa	3,358	3,251	4,539	5,084	4,689	6,304
Other countries	950	1,252	2,011	1,635	2,988	4,757
Grand total	130,836	149,339	156,605	183,169	206,212	257,085
Percentage to:						
Latin America	33.2	35.1	34.5	30.9	26.4	24.9
Asia	16.7	11.1	12.3	10.8	11.6	11.0
Canada, Newfoundland	17.8	16.2	19.8	21.3	24.1	26.0
Europe	24.6	30.6	24.5	29.0	31.0	30.6
Australasia	4.4	4.0	4.7	4.3	3.1	3.1
Africa	2.6	2.2	2.9	2.8	2.3	2.5
Other countries	.7	.8	1.3	.9	1.5	1.9

Trade with Mexico was the largest in recent years, the bulk of the shipments consisting of mining machinery and construction and conveying machinery. Important irrigation and highway construction work continued throughout the year.

One of the most noteworthy developments was the increased trade with Africa, shipments to that continent being 34 per cent greater than those of 1928. The largest shipments, as usual, went to the Union of South Africa, and consisted mainly of mining machinery for the gold, diamond, and coal mines of that region. Portuguese East Africa purchased 55 per cent more machinery than in the previous year, the bulk being construction, conveying, and mining equipment.

In northern Africa, Algeria and Tunisia, and Egypt showed the greatest activity, shipments to Algeria and Tunisia being quadrupled and those to Egypt doubled.

Exports to Asiatic countries (excepting the near East) were more than one-sixth greater than for the previous year and were the largest since the abnormal post-war years. Japan, India, and China made notable gains, the trade of the latter being double that of the off-year 1927, and about 20 per cent above the 1928 level. The Philippine Islands, on the other hand, purchased about 14 per cent less than the record volume of 1928. It is interesting to note that British India is usually a much larger market than the Philippine Islands, but that in 1928 the latter forged far ahead, and in 1929 the amount purchased by each country was identical.

IDEAS FROM PRACTICAL MEN

The department, "IDEAS FROM PRACTICAL MEN," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from a minimum of five dollars upwards, depending upon their merit.

An Improvised Drill Jig

By ARTHUR V. O'BRIEN
Supt. of Shops, University of Iowa

A HAND-OPERATED coil winder for radio work had to be duplicated several times, but the limited quantity to be built would not warrant the outlay for an expensive jig for the shaft holes in the frames.

A set of buttons, bored, turned, hardened, and ground

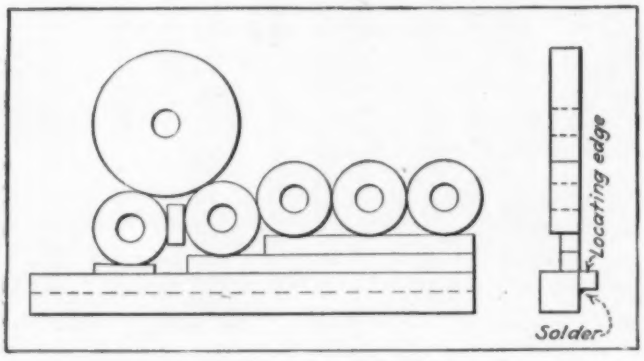


Fig. 1—Layout of the jig

to the pitch diameters of the several gears had been made. The center holes were ground to the sizes of the shaft holes, with the idea of using a center punch fitting the holes to locate the shaft centers. The difficulty of

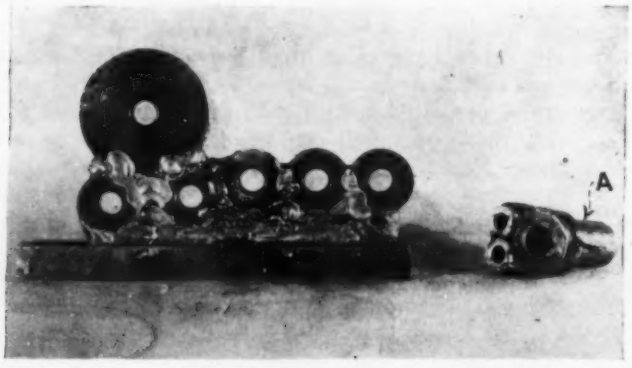


Fig. 2—Bushings held in place by soldering

clamping the buttons to the work in the proper positions, led us to solder them together and use them as jig bushings.

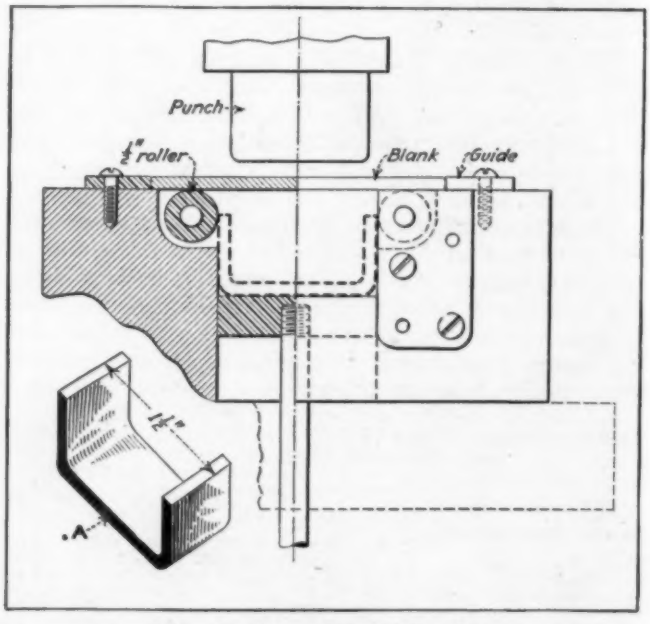
The buttons were laid on a flat plate touching each other and were spaced vertically by pieces of cold-rolled steel of the proper size, giving the correct locations from the side of the ½-in. square piece forming part of the base, as shown in Fig. 1. The whole assembly was then soldered together with half and half solder, using zinc chloride as a flux. Afterward, a piece of ½-in. square cold-rolled steel was soldered along the base piece, as shown in the end view at the right, to locate the holes from the back side of the frame. With the jig clamped on the work by small C-clamps, it was located from the bottom of the frame by the end of the base piece.

The completed jig, which was very satisfactory in every way, is shown in Fig. 2. At the right is another jig, made in the same way, for drilling two ½-in. holes for gear shafts, with reference to a previously-bored hole in which the part *A* acted as a pilot. In this case, the three buttons, ground to the pitch diameters of the gears, were tied together with wire and then firmly soldered in place.

A Roller-Type Bending Die

By L. L. LOCKE

When a sheet-metal stamping is to be bent to form in a die, there are several factors to be considered. First of all, the spring of the metal is likely to cause some difficulty, and it will often be found necessary to



A forming die equipped with rollers

make the bend slightly greater than is required to allow for the natural spring of the metal. For example, in bending a small, flat piece of sheet metal to a right angle, it may be necessary to bend it so that the included angle will be 85 deg., because the bent portion will spring back after the bending pressure has been released.

Another important point to be considered is wear on the die edges, especially when the metal is to be drawn over a form.

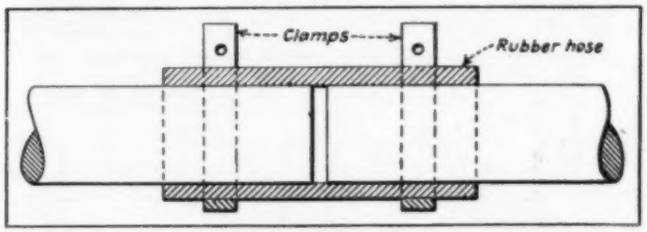
In bending the U-shaped piece shown at *A* in the illustration, there was some difficulty caused by the wearing action that took place in the die. To overcome this difficulty, a die equipped with hardened steel rollers, such as shown, was made. The blank was located centrally between nest plates, resting on the rollers. As the punch descended, it drew the blank through the opening between the rollers, the bending pressure being absorbed by them. In comparison with a die of solid construction, it was found that the one with rollers had an increased life of approximately four to one, with the added advantage that replacement of the rollers was more economical than the making of an entire new die block.

Spring Flexible Coupling—*Discussion*

By Charles Kugler

The article by Malcolm K. Parkhurst, under the title given above, on page 832, Vol. 71, of the *American Machinist,* reminds me of an emergency coupling used by a millwright of my acquaintance.

Having to connect two small shafts, and no coupling being at hand, he used a piece of garden hose and two hose clamps, as shown in the illustration. The emergency coupling served until the arrival of a coupling that



An emergency coupling

had been ordered in the meantime. While both of the shafts were in line, it is evident that the piece of hose would have answered the purpose if they had been slightly out of line.

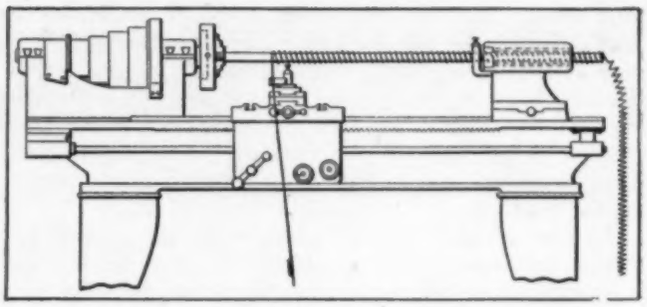
Coiling Long Springs

By Harold C. Rose

Master Mechanic, Anaconda Wire & Cable Company

Some time ago, we had occasion to make some helical springs ½ in. in diameter and 100 in. long. Since we had no spring-coiling machine, the job had to be done in a lathe. As the distance between the head and tailstocks of the lathe available for the work was less than 100 in., we had to devise means for coiling springs of the length required. In rigging up, we decided to arrange matters so that a continuous coil could be made and cut up into the lengths desired.

Both the tailstock spindle and the bushing for the rear end of the tailstock screw were removed. A bushing having a hole $\frac{1}{16}$ in. larger than the diameter of the springs was fitted into the spindle hole. A rod, on which to coil the springs, and long enough to extend through the tailstock, was secured by one end in the chuck. One



Lathe arranged for coiling springs continuously

end of the wire to be coiled was clamped on the rod by a dog next to the tailstock, as shown in the illustration. The wire was taken from a reel and threaded through a hole in a piece of steel held in the toolpost. The lathe was geared for a left-hand screw of the same pitch as that of the springs, and was run backward, the wire leading on the top of the rod.

After the wire had been wound up to the chuck, the lathe was stopped, the dog unclamped, and the carriage was run to the right as far as it would go, pushing the coils over the rod and through the tailstock. The coils were then clamped next to the tailstock by the dog, and the lathe was started again. By repeating this process, all the wire on the reel was coiled into one long spring.

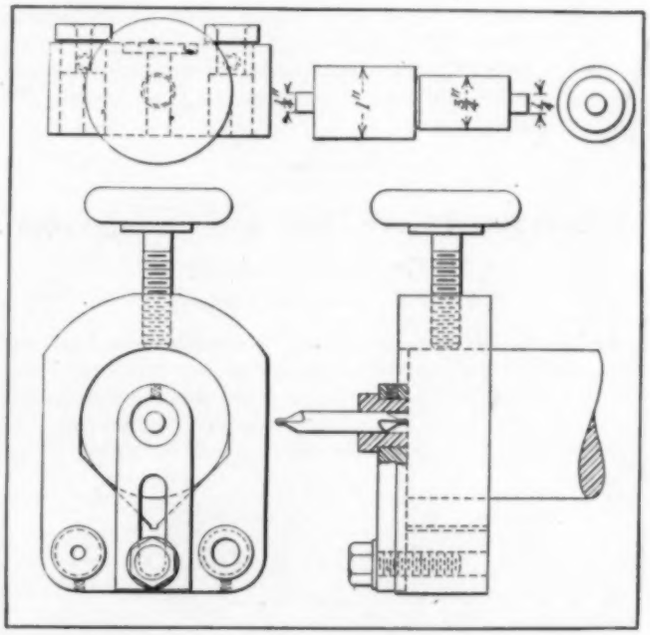
Jig for Center Drilling

By Theodore Kruger

Toolroom Foreman, The Diamond Machine Company

The jig shown in the illustration was devised for the accurate center drilling of round stock from $\frac{3}{8}$ to 2 in. and square stock up to 1½ in. It is intended for use in shops that do not have enough centering work to afford a regular centering machine.

The body of the jig is in the form of an inclosed V-block. The bushing plate is adjustable, so that the bushing can be brought over the center of work of vari-



Jig for accurate center drilling of round and square stock

ous sizes. It is set by a series of plugs similar to the one shown at the top, each plug having two sizes. With one of the setting plugs clamped in the jig, and a ¼-in. bushing in place, the bushing plate is loosened and moved so that one of the teats on the ends of the plug will engage in the hole in the bushing. The bushing will then be central over a shaft of the same diameter as that of the plug.

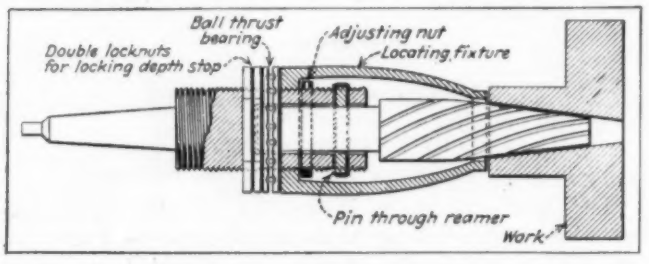
In two corners of the bushing plate are carried two extra bushings to fit combination center drills and countersinks of different sizes. It is but the work of a moment to take out the bushing over the V-block and to replace it with one of another size. Keeping the extra bushings in this manner keeps them handy when wanted.

Reaming Taper Holes to a Given Depth

By Glen J. Miller

When a number of taper holes are to be reamed, considerable time is lost in gaging each one unless an efficient stop is employed. The fixture illustrated has the advantage of acting directly on the surface of the work without marring it.

A four-armed cage is mounted on the toolholder so



Ball bearing reamer stop

that the thrust is taken on a ball bearing. Its vertical position is adjusted by nuts above and below. The reamer is held by means of a pin which allows it to float.

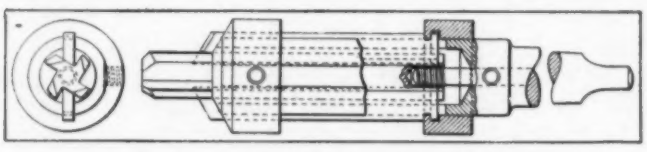
When in use, the cage is located so the reamer will project below it the desired depth. The entire fixture is fed downward until the lower face of the cage touches the work, preventing further travel. The use of the ball bearing allows the cage to remain stationary while the reamer is revolving.

A Combined Core Drill and Countersink

By Charles C. Tomney

Brunswick-Kroeschell Company

In the illustration is shown a combination tool for core drilling and countersinking the tap holes of globe valves and pipe fittings. At the same operation in which the core drilling is done, the holes are countersunk, so that the first threads cut by the tap will be about $\frac{3}{32}$ in.



Combination core drill and countersink

from the surface, and will thus be protected from damage in handling the work.

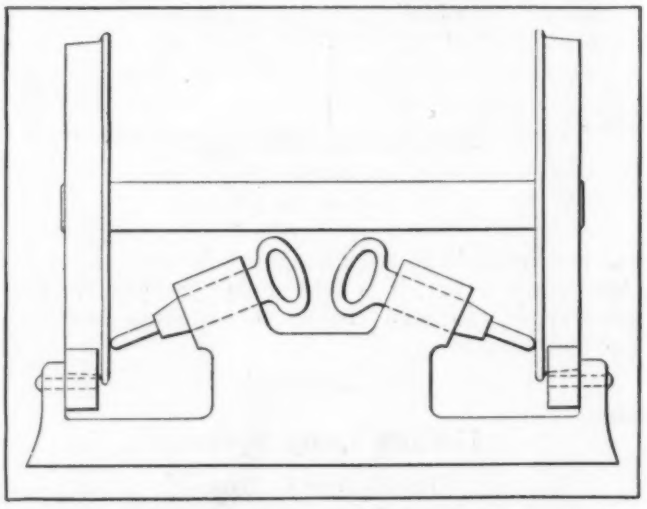
While the tool has a tapered shank to fit the spindle of the drill press, it can be used in the turret lathe by providing a special socket. The body of the tool is bored to receive the core drill, which is held in place by a threaded rod at the shank end. Slots are milled nearly the entire length of the body to receive the cutting blades of the countersink. The slots are milled on the center line of the body and are diametrically opposite one another.

The wall of the body is made thin, so that when the setscrew in the collar at the left is tightened, the spring will give a good grip on the blades. This collar is slotted to go over the blades, the slots being slightly wider than the slots in the body, so as not to interfere with the clamping action. The blades are held in position, longitudinally, by the collar at the right, which has an annular groove to engage the hooked ends of the blades, keeping them in place. The core drill is driven by the blades of the countersink.

Peening Retaining Rings with Air Hammers

By Clifford H. French

Retaining rings are used on many driving and truck wheels on both Japanese and Chinese railroads for holding the tire against side movement on the wheel center. Some railway shops rivet or peen the rings into place



Machine that utilizes two air hammers for peening retaining rings in place

with hand air hammers while some use a special machine with a roller that does the job while the wheel is turned under the roller.

One shop of one of the large railways has built the device illustrated in which the pair of wheels is placed on rollers in such a position that two air hammers, which are rigidly mounted on the machine, reach the rings to be peened. The height is of course adjustable for the thickness of the tire. The wheels are revolved slowly by means of one of the small wheels on which the tires rest. This makes an inexpensive machine and enables one man to do the work very quickly as well as securing a more even peening than can be done by hand.

Nitriding Steel

THE nitriding process consists in the subjection of special alloy steels to the action of ammonia gas at a suitable temperature, producing a hard, wear-resistant surface, similar to that produced in case hardening but more easily obtained and of greater hardness. The surface produced is free of scale, of attractive appearance, and requires no after treatment. Also, hardening of certain sections only is easily accomplished by any one of several methods.

History

It has been known for many years that iron, when heated in an atmosphere of ammonia, becomes impregnated with nitrogen in the form of iron-nitride needles. This condition is undesirable because it causes great reduction of the shock resisting properties of the metal. More recently Dr. Fry of Essen, Germany, made a study of the formation of nitrides of iron and other metals and, as a result of his studies, produced steels that would take on a surface hardness without the undesirable needle structure.

When to Nitride

The steels best suited to case hardening by ammonia are those containing 0.75 to 1.25 per cent of aluminum and 1.00 to 1.50 per cent chromium with 0.20 per cent molybdenum added to give greater toughness to the case and core. These steels are manufactured under the name "Nitralloy" in carbon contents ranging from 0.20 to 0.40 per cent.

Process

The parts to be case hardened are first machined to the desired shape, leaving them slightly oversize. They are then heat-treated and afterward machined or ground to the finish size. This finish machining is done in order to remove the skin of decarburized material and provide a clean surface. They are then placed in a suitable furnace in an atmosphere of ammonia and heated to a temperature of 900 deg. F. to 1,000 deg. F., 975 deg. F. being the most common. They are held in the furnace from two to ninety hours, depending on the depth of case desired, and are then cooled in the furnace, the ammonia atmosphere being maintained. Upon removal from the furnace they are hard and may be put in service without further treatment. The ammonia in the presence of the steel at the temperature of the furnace dissociates into nitrogen and hydrogen. The nitrogen enters the steel to form the hard case, while the hydrogen and undecomposed ammonia pass out of the furnace. The amount of ammonia left undissociated is easily determined by solution in water in a suitable pipette. The dissociation is maintained between 20 per cent and 40 per cent for best results.

Partial Hardening

It is sometimes desired to harden one portion of a machine part while the remainder is left soft and machinable. There are several methods of protecting the portions that are not to be hardened. A thin nickel coating electrolytically deposited is effective, but somewhat inconvenient to apply. Molten tin or solder applied as a very thin coating is often used. Though molten at the nitriding temperature, enough tin will remain by surface tension to give ample protection. A more convenient protecting agent is tin oxide (either stannous or stannic) mixed with a suitable vehicle to form a paste. This coating has the advantage that it is easily brushed off after the nitriding operation.

Precautions

It is necessary to remove all decarburized material from the surface before nitriding. Failure to observe this precaution will result in a spalling case entirely unsuited to service. Strains should be removed from all parts to be nitrided by drawing at temperatures equal to or higher than the nitriding temperature. Strains left in the metal will cause some distortion when heated to the nitriding temperature.

Finishing

A slight growth, amounting to 0.001 in. or less, takes place on nitriding. For very accurate work this may be compensated for by machining under size before nitriding or by lapping after the operation.

Advantages

The advantages of nitriding are many. The hardness, equivalent to 1,000 to 1,100 Brinell, is greater than that obtainable by any other treatment. The low temperature used gives low power consumption and easy control as well as long furnace life. The low temperature also eliminates distortion if the parts are properly drawn before nitriding. Besides great hardness, the nitride case shows remarkable resistance to corrosion, although resistance to mineral acids is somewhat reduced. The parts coming from the nitriding furnace show a clean surface free from scale and of attractive appearance. Not the least of the advantages is that no after treatment is required, the parts being hard when taken from the nitriding furnace.

Present Uses

The nitriding treatment of steels is growing rapidly. The automotive and airplane industries are using the process to harden many parts subjected to severe service. The wide variety of applications so far found for the process has caused its adoption by instrument manufacturers, machine-tool manufacturers, and shoe machinery manufacturers.

Courtesy of Chicago Flexible Shaft Company

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American Machinist

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

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What Price Exports?

EXPORT of even a small percentage of the product in almost any line of manufacture is a very desirable adjunct to the home market. Even where the export does not exceed ten or fifteen per cent it helps out a lot in providing work for the shop and so keeping the organization together even if the profits do not make an impressive total. But exports are almost directly related to imports, a point which many manufacturers seem to overlook.

Machinery sales managers who are familiar with foreign markets and foreign conditions realize that high import duties not only tend to prevent foreign goods coming into this country but they are also likely to reduce exports. For, after all, trade is not far removed from barter in principle, only in the manner of application. Instead of trading lathes directly for rugs or jewelry we sell the one and buy the other with currency or credit of some sort. And unless the foreign country can sell us products of some sort they cannot buy our manufactures in exchange.

Just how high or how low to make tariffs is a delicate question requiring much more careful study than is usually given to tariff schedules. But it must be remembered that no business, foreign or domestic can be built on a one-sided basis. Unless both sides get a fair deal business slows down and both sides suffer in consequence.

*

The First Quarter

NOW that we are well past the first quarter of 1930, and most of the barometric statistics are at hand, we can check up results with forecast and see where we stand.

The metal trades, apparently, are not doing so badly. Counting out 1929 as entirely abnormal, business during the first three months has not been far from the average of other good years, 1928 for example. Reports to the National Metal Trades Association and to the National Machine Tool Builders' Association show that business has been about twenty-five per cent off from the corresponding period of 1929. These figures represent averages, of course. Some companies have done better than the average; a few much worse.

Those prophets who looked for a sweeping upturn by the end of the first quarter must give way to the more conservative and less optimistic forecasters who hoped that such might be the case but placed the revival in the third quarter. Business in the United States has recovered more rapidly than business in other countries, but it is still something short of satisfactory.

Unemployment there has been, and some hardship, undoubtedly. How much, we are not sure; our employment statistics are still inadequate. The principal burden, as usual, has been borne by the unskilled laborer. Some employers even report difficulty in finding skilled workers in several trades.

The first quarter is behind us. It was neither so good nor so bad as it might have been. Let's forget it and work to make the other three better. There is still a considerable amount of housecleaning, modernizing, and scrapping of obsolete equipment to be done if one can judge from the first questionnaires of the *American Machinist* obsolescence inventory to come in. And now is the time to do it.

*

Wanted—A Soda-Proof Finish

SAD indeed is the usual fate of the finish on a machine when soda-water is used during cutting operations. Under such conditions even a six-months-old unit looks distinctly seedy, with its general nakedness brazenly exposed.

Most of us have been educated up to the point where we like to have our production machinery look shipshape, even though it is highly utilitarian in purpose. Appearance advertising has had its effect on every one. Not so long ago the machine tool builders adopted a standard color, and the effect of the general use of this standard at the last show aroused much favorable interest.

But soda-water is death on even the machine tool builders' sacred standard. Here is a job for the paint and lacquer chemists. The sooner they lick it the sooner will the offenses to the esthetic senses of production men and operators be eliminated.

SHOP EQUIPMENT NEWS

Barnes 16-Inch Automatic Lathe

MANY new and unusual features are to be found in the 16-in. automatic lathe recently developed by the John S. Barnes Corporation, Rockford, Ill., a division of the W. F. and John Barnes Company of that city. Hydraulic feed and control are the outstanding features of the machine, which also evidences simplicity of design and efficiency of operation. It is claimed that the lathe removes far more metal per horsepower than any other machine tool developed to date. The unit is entirely unconventional in design and appearance, even to the extent of having the spindle rotate clockwise, as opposed to counter-clockwise rotation in all other lathes.

In essence, the unit consists of a spindle driven through a simple train of gears, a universal front carriage that can be employed not only to feed the cutting tools into the required depth and turn straight, but also to turn tapers, and a rear tool slide bolted to a large flat surface machined on the rear of the unit bed. The rear tool slide can be slid along the bed to whatever position is desired and then set to feed in hydraulically. Hydraulic means are also provided for bringing the front tool slide into position and for moving it longitudinally toward the spindle head. On the same large flat machine surface to which the rear tool slide is fastened, the tailstock is also bolted. It carries a ball-bearing live center and is advanced to the work with a large handwheel shown in the illustration.

A single motor located in the rear of the bed drives the spindle and the feed, rapid-traverse, and coolant pumps. Power to rapid traverse both the front and rear slides is obtained from a pump driven by a chain connected to the motor. Power for feeding both the front and the rear slides is obtained from special pumps driven and controlled through the main spindle; that is, these pumps operate only when the main spindle is rotating. The spindle driving mechanism is extremely simple. In the rear, Fig. 2, is shown the drive chains and sprockets with the guards removed and the large motor compartment with the cover removed. Chain drives take power from the motor pinion to a jackshaft carrying a disk clutch, through which pick-off gears are driven. The final drive to the spindle is through herringbone gears so that only two tooth contacts are provided in the system. Spindle speeds varying from 30 to 375 r.p.m. can be obtained by interchanging the pick-off gears. These gears are readily accessible through a cover held in place by thumb nuts.

The front carriage, illustrated in Fig. 1, is clamped upon and supported by a horizontal shaft, 4½-in. in diameter, which rotates and also moves longitudinally in large size bronze bushings located in the bed. Upon the carriage is an adjustable cross-slide slotted in the usual manner for holding toolblocks. Longitudinal feed to the carriage is direct through the shaft to which it is clamped, the shaft being fastened to the piston rod of the hydraulic cylinder located at the headstock end, under the headstock proper. In and out feed of the front tool carriage is also direct. The whole carriage pivots about the horizontal shaft and an adjustable roller under the carriage rests upon a hardened and ground guide bar, which is pivoted on one end, that nearest the headstock. An hydraulic piston controls the movement of this guide bar, which in its ordinary open position is tilted downward at an angle. In the actual operation of the lathe, this bar is rapid traversed into a horizontal position where it is held against a positive stop, which is adjustable, so that, if desired, tapers can be cut in either direction. Once the guide bar is in a horizontal position, the tools which have now reached their depth need only be fed longitudinally toward the head. Adjusting the stop up or down gives the taper desired, as the guide bar is inclined for taper but is horizontal for straight turning. Sufficient upward pressure is applied against the stop so as to be greatly

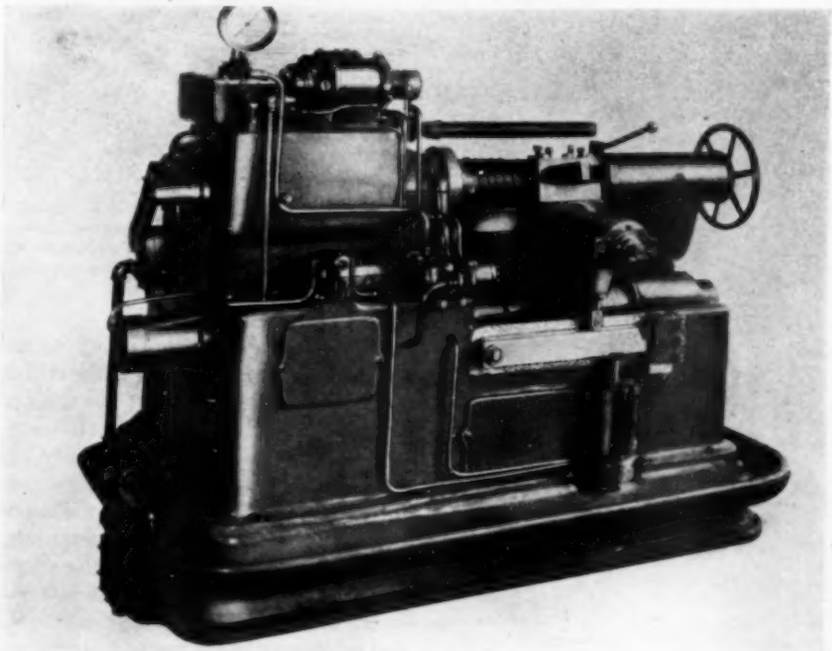


Fig. 1—Hydraulic feed and control on the Barnes 16-Inch Automatic Lathe permit an unusually high removal of metal per horsepower applied

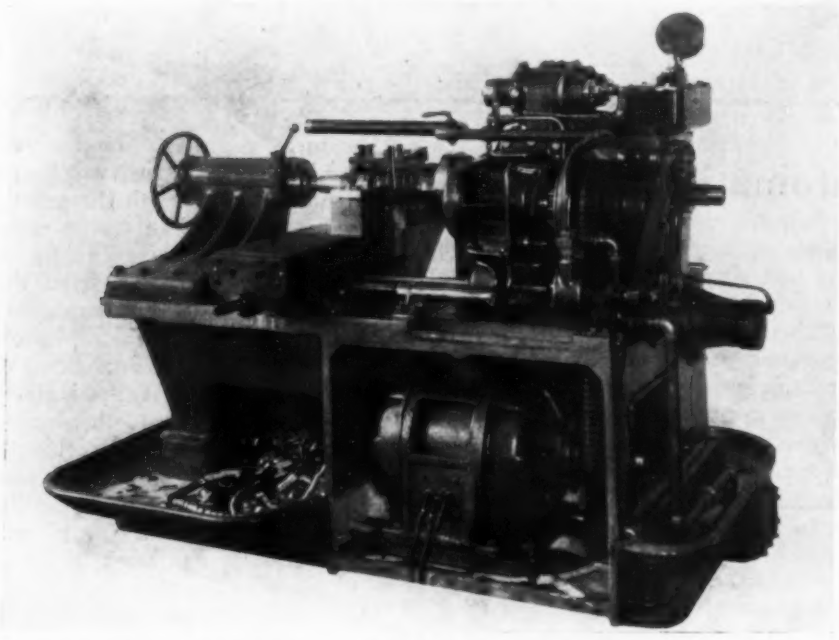


Fig. 2—Evidence of the ability of the Barnes Automatic Lathe to remove metal is shown in the chip pan. Chain drives connect the shafts

in excess of any possible work load.

The rear tool slide is fed in hydraulically by a piston and cylinder built into the rear slide unit, and the piping arrangement is such that this slide can be adjusted longitudinally along the bed to suit the particular work being done. As mentioned before, the spindle rotates clockwise, bringing the work load downward on the rear tool slide directly against the lathe bed. The load on the front carriage is upward, but because of the heavy horizontal shaft, the machine is particularly suited to take loads in this direction at the front.

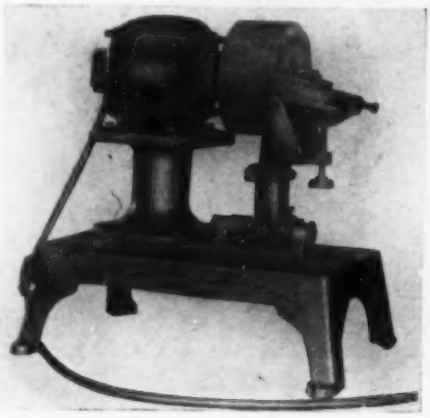
A single control lever at the front controls the rapid traverse, and the speed and feed mechanism are operated in response to the rapid traverse action; that is, as soon as rapid traverse ceases, feed immediately takes place, the action being controlled by suitable stops on a control bar. Feeds for the front and rear slides can be set independently, dials being provided on each pump to adjust the feeds in thousandths per revolution of spindle. Variations from 0.001 to 0.10-in. per revolution are possible.

The main spindle is carried on a taper bronze bearing at the front end and a pair of preloaded ball bearings at the rear end. Anti-friction bearings are also used throughout the drive mechanism. The bed and headstock are cast integral and are of generous proportions. Ample space is provided for falling chips and a large opening is at the rear for raking them out.

Wells Tool Sharpener

The sharpening of reamer blades, inserted milling cutter blades, die chasers, and box tool blades may be done on the tool sharpening machine announced by the Wells Manufacturing Company, P. O. Box 613, Greenfield, Mass. The machine is electrically driven and the cup wheel is mounted directly on the motor spindle. It will grind blades or chasers of any ordinary width or thickness and up to 4 in. long. The work is laid on a flat plate up against an adjustable stop and held by a simple clamp. This work-holding plate can be swiveled for any desired taper, and can be adjusted to grind any bevel on the cutting edge.

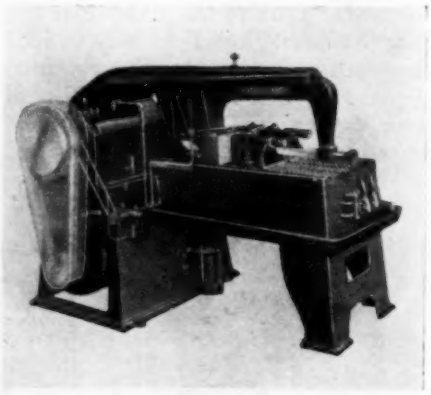
The work-holding plate swings past the wheel on pivots, which are protected from dust and adjustable for wear. It is claimed the machine will grind a set of blades or chasers so that all are exactly alike. A $\frac{1}{6}$-hp. motor operating on 110 or 220 volts is furnished.



Wells Sharpening Machine for reamer blades, inserted milling cutter blades, die chasers, and box tool blades

Racine Hydraulic Power Saw

For the reason that hydraulic feed is powerful and rigid, yet flexible to meet any kind of metal cutting requirements, it has been embodied in a hydraulic power saw announced by the Racine Tool & Machine Company, Racine, Wis. This machine was designed to incorporate most of the features of the previous positive feed shear cut production saw, but the feed and a number of other functions are now accomplished hydraulically. It is claimed that this machine can use the same blade for cutting thin-walled tubing as solid bar stock, under a range of feeds that provide the proper cutting speed for any kind of material.



Hydraulic feed on the Racine Hydraulic Power Saw permits faster cutting at the beginning and the end of a cut than at the center of the bar, and thus lowers the cutting time

By means of this hydraulic feed, the machine can be made to cut faster at the beginning and end of the cut in round stock than it does at the

center. This feature lowers the cutting time. Also, it is claimed that the blade life is longer because the lift on the non-cutting stroke is accomplished in a better manner. The machine has a capacity of 9x9 in. in solid stock, although larger pieces have been cut on test.

DeVlieg No. 31-B Series "Supermil"

ABILITY to mill both with and against the feed on the No. 31 "B" series "Supermil," announced by the DeVlieg Machine Tool Company, Jackson, Mich., makes possible continuous milling with fixtures secured rigidly to the table. The machine is designed and built for production work of small or large quantities and heavy or accurate work, and has such convenience and accessibility as to make it rapid in operation and easy to set up for short runs.

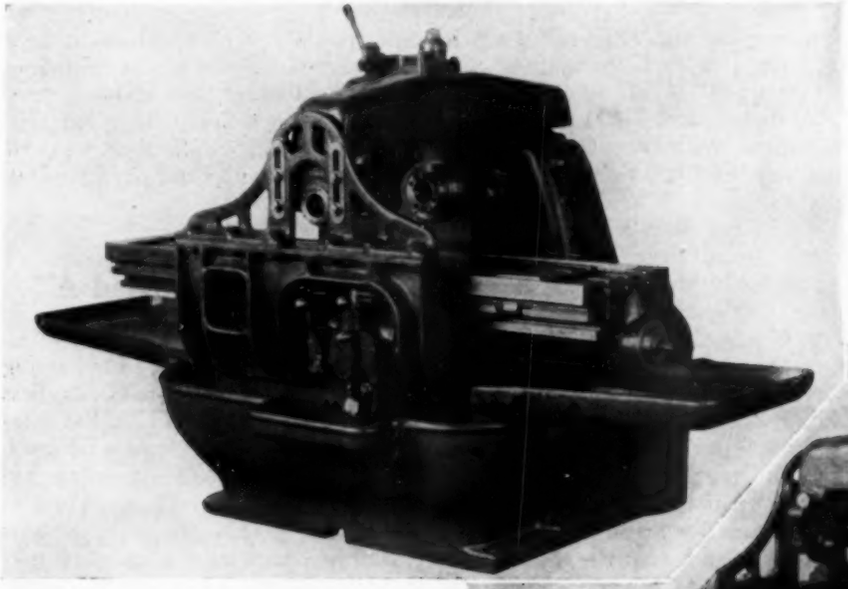
The main bed is a heavily ribbed casting carrying the hardened ways and all the lower mechanisms. The model 31 employs double columns, the principal one being bolted against three faces, thus eliminating the necessity for dowels. The table is a heavy casting of a semi-steel nature, whereas the pan is a separate casting providing a voluminous tank and ample means for handling an abundance of coolant and chips.

Two Timken bearings support the alloy steel spindle, which is hardened and ground, these bearings being carried in a heavy, hardened and ground steel quill. The nose of the spindle is of the National standard construction. The overarm is a ram-type casting located by a small vee at the center and narrow flats at the extreme edges. It is clamped into position with heavy T-members and wedge bolts, one on each arbor support and two on the main spindle head. The arbor supports are provided with bushings adjustable for wear.

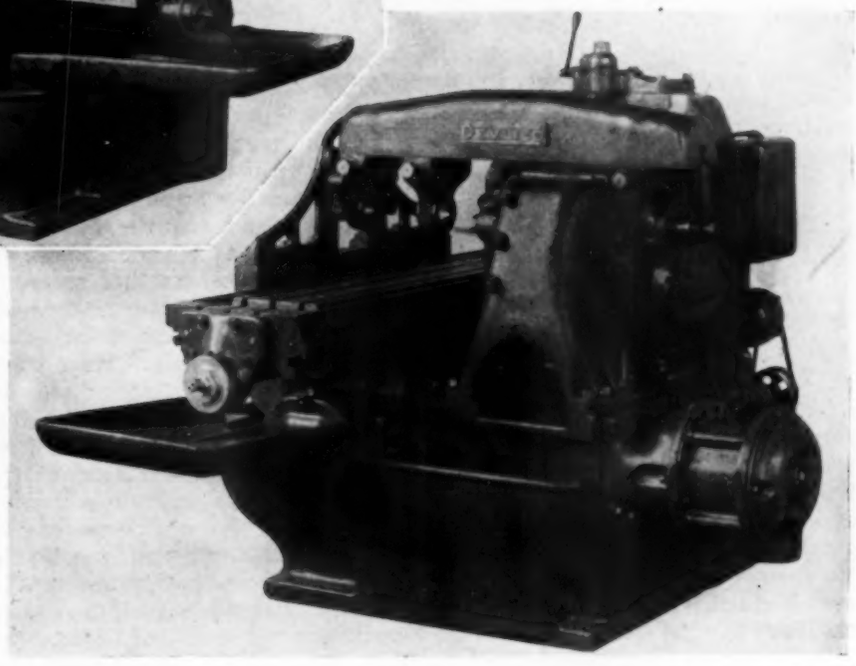
Vertical adjustment of the spindle head is effected by operating the screw secured to the vertical adjusting bracket. A micrometer dial provides for accurate setting. When adjusting the spindle head, it is necessary to loosen the two clamp nuts on the front gib, the center nut of the rear gib, and the gib bolts of the second column. After the adjustment has been made, these three are again locked. Cross adjustment is effected by operating the hexagon and graduated dialed member at the front of the spindle head. To adjust the quill, the hexagon nut is first loosened.

The starting and stopping lever is at the front of the machine, and is the lower one of the three. Of the two upper levers, the left is for either direction of the rapid traverse, whereas that on the right is for the feed, and like the rapid traverse lever, effects table movement corresponding to the direction of its operation. The feed can only be engaged when the spindle is running. Trip dogs are provided for various cycles of operation.

The feed mechanism provides movement to the table with a rapid traverse and power feed in either



Built heavily to permit "climb" cutting, the DeVlieg No. 31-"B" Series "Supermil" can mill in both directions, the work being placed in suitable fixtures



Seen from the rear, the machine bears out the claims of heavy construction and compact drive arrangements

direction with selective controls. The "Supermil" feed mechanism is of two-unit construction, one for the rapid traverse and the other for the power feed, and each directly connected to a double-geared sleeve splined to the feed screw. The rapid traverse operates the table at a constant rate of 180 in. per minute.

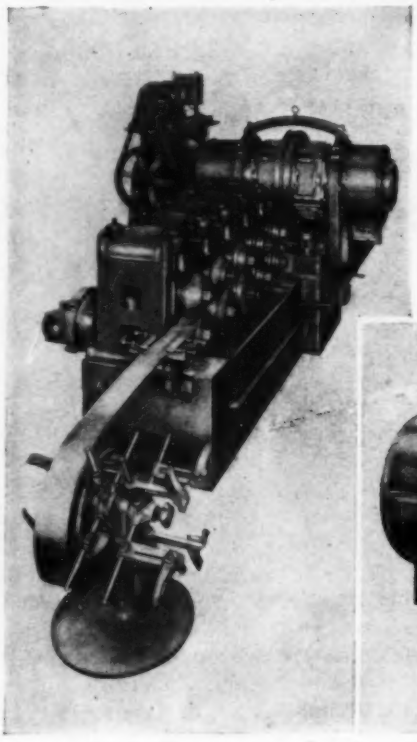
When an alternating cycle of milling or climb-cutting is desired, the use of the backlash remover is recommended. This action of this mechanism is to cause the screw to bear securely at all times against the side of the thread in the nut. This unit is furnished as an extra.

The entire main drive bracket, the screw, nut, feed mechanism, table ways, and control unit are all automatically oiled from a central pumping system. The entire spindle head is lubricated by being submerged in oil. As for the coolant system, a geared pump is belt driven by an individual motor, wired in series with the main motor. The piping extends from the pump to the vertical adjustment bracket on the top of the column, and thence to a valve tapped to receive any desired arrangement of piping.

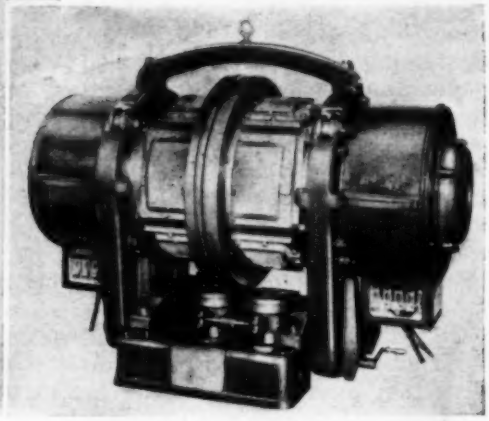
Specifications: Table feed, 30, 36 or 42 in.; working surface of table (30-in. model), 16x66 in.; cross adjustment of spindle, 2 in.; maximum distance center of spindle to top of table, 14 in.; minimum, 3 in.; center of spindle to underside of overarm, 6½ in.; number of spindle speed pick-off gears furnished, 2; range of speeds (pick-off gears), 20 to 180 r.p.m.; range of feed with pick-off gears, 1.7 to 20 in. per min.; motor, 10 hp., 1,800 r.p.m.; net weight of standard machine (30 in. unit), 7,500 lb.; floor space, (30-in. feed), 105x72 inches.

American "Acyclic" Generator for Tube Welders

Heretofore, in the manufacture of tubing, in which the flat skelp is formed into a tube, and then electrically welded, an alternating current has been used. Although successful at low speed, the current is not satisfactory for welding operations in excess of 60 ft. per min., because of the fluctuation in temperature occasioned by the frequency of the alternating current. A so-called stitch was formed at each fluctuation. In the case of 60 ft. of weld per min., or 720 inches, and 7,200 fluctuations per minute for 60-cycle current, a stitch occurred at every 0.10 inch along the seam.



"Acyclic" Generator mounted on a tube welding machine



Below—American "Acyclic" Generator, which will weld tube seams at the speed of 200 ft. per min. without stitches. It provides a current of 20,000 amperes at 2½ volts

This defect may be overcome by the use of an electric welding unit brought out by the American Electric Fusion Corporation, 2610 Diversey Ave., Chicago, Illinois. This unit, known as the "Acyclic" generator instead of utilizing a.c. directly for welding, employs it for driving the two 35-hp. motors connected to the generator portion, which is itself capable of generating 20,000 amperes at 2½ volts. The arrangement of the generator is such that the delivery of welding current is made directly to the circular bus bars that surround the stator of the generator, the welding rings being directly attached to these circular bus bars. Thus, while the rotor of the generator rotates at a high rate of speed within the generator frame, the frame itself rotates slowly over the seam of the tube as it passes beneath. On trial, it has been shown that speeds as high as 200 ft. per min. can be obtained readily with this unit and it is further claimed that with increased excitation and increased horsepower, that speeds can be obtained at least twice again. Since a direct current is not fluctuating, the welding temperature is not fluctuating and produces a smooth continuous weld of a strength equal to the parent metal.

Lincoln "Stainweld A" Welding Rod

An electrode to be used for welding the commonly called "18-8 Stainless Steels," has been placed on the market by the Lincoln Electric Company, Cleveland, Ohio. This welding rod is known as "Stainweld A," and is claimed to give welds of the same chemical content as the stainless steel itself, resulting in a dense ductile weld. This is accomplished by having the welding done in a protected atmosphere, thus excluding the oxygen and eliminating oxidation of the weld metal.

The rod itself is of the same chemical composition as the metal, and is coated with a material which, in the intense heat of welding, forms a gaseous envelope around the arc. It is used with reversed polarity and permits the making of a weld that is as impervious to corrosion as the metal it joins.

"Stainweld A" is obtained in three sizes, $\frac{1}{4}$ in., $\frac{5}{32}$ in., and $\frac{3}{16}$ in., of the regulation 14-in. lengths. It can be used for horizontal, vertical, or overhead welding.

Crown No. 55 Overhanging-Type Polishing Lathe

Direct spiral gear drive is employed in the overhanging-type lathe announced by the Crown Rheostat & Supply Company, Chicago, Ill. The machine is built with an overhanging spindle, which is placed forward from the usual position by 10 in., thus bringing the spindle 4 in. in front of

A spindle 4 in. in front of the stand on the Crown Polishing Lathe permits handling long and curved pieces

the face of the stand. This permits a much greater working radius in handling such work as long and curved pieces, which may include bumper bars, radiator shells, and long tubes.

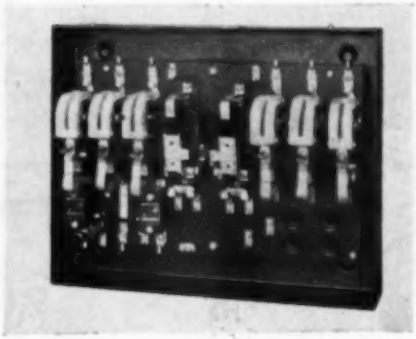
The frame is of heavy and rigid one-piece construction, and the motor is mounted in an out of the way position at the rear. It is claimed that the spiral gear drive permits an efficiency of 97½ per cent, not deducting the bearing losses. All of these bearings are equipped with ball bearings, thus eliminating noise and vibration. The driving gear is of hardened steel.

General Electric Improved Magnetic Reversing Switch

This magnetic reversing switch of improved design, announced by the General Electric Company, Schenectady, N. Y., is designed as CR-7009-B-18, and supersedes the model B-5 switch of the same type. It has sufficient capacity to control motors of greater horsepower than the former model.

The improved switch is designed to throw small a.c. motors directly across the line. It consists of two triple-pole, mechanically interlocked, magnetically operated contactors with restricted type blowouts, and with a normally open interlock on each contactor. It also has two hand-reset temperature overload relays. The contactors are mounted side by side on a molded base, instead of back to back as in the previous design.

The device is contained in a drawn-shell steel inclosing case. It is available for voltages from 110 to 600, to give from 7½ to 15 hp. on 3- or 2-phase, 3- or 4-wire systems, and from 3 to 10 hp. on single-phase circuits.



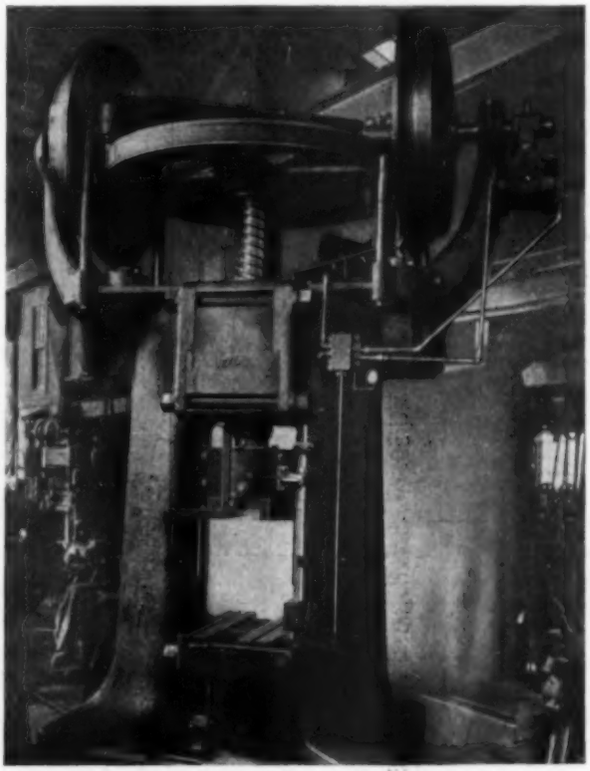
General Electric Type CR-7009-B-18 Improved, Magnetic, Reversing Switch

Zeh & Hahnemann No. 25 Percussion Power Press

AN UNUSUALLY large size of its patent percussion power press has been built by the Zeh & Hahnemann Company, 182 Vanderpool St., Newark, N. J. This machine, known as the No. 25, weighs 50 tons, but is not the largest size that can be manufactured. Its frame is made of a steel casting and the main screw is made of tool steel, heat-treated. This screw is 14 in. in diameter. The press has a height of 18½ ft. over-all and requires 50 hp. for operation. It is used to produce hot pressed brass parts, but is also adapted for embossing work and for hot or cold pressing of steel parts.

A press of this type can produce a steel forging in one blow, and is especially serviceable for upset parts. Although the No. 25 press is rated to yield a pressure of 625 tons, a maximum of 1,800 tons was obtained under test. Energy stored in the flywheel amounts to 50,000 ft.-lb., or the equivalent energy of a 10,000 lb. hammer falling 5 feet, giving plenty of power for cold-pressed work.

Pneumatic control is furnished on the press which is easily operated. It



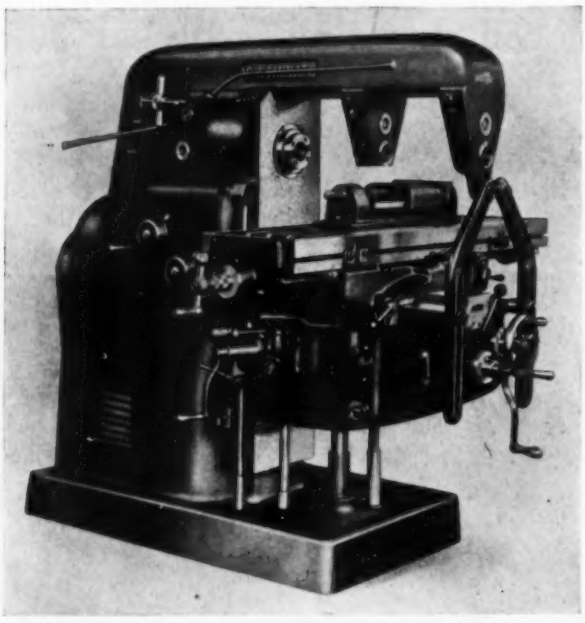
For hot pressed brass parts or hot or cold pressed steel forgings, this No. 25 Patent Percussion Press has been brought out by Zeh & Hahnemann

reverses automatically at the end of the down stroke and stops at the up position. It has a stroke of 22½ in., and the rate of operation is 10 strokes per minute. Slide and bottom knockouts are provided to eject the finished pieces quickly from the dies.

It is claimed that ordinary cast iron has been forged successfully on this machine.

Cincinnati No. 4 Plain and Universal Milling Machines

THE general characteristics of the No. 3 milling machine, described on p. 603, Vol. 71, of the *American Machinist,* are evident in the No. 4 plain and universal types announced by the Cincinnati Milling Machine Company, Cincinnati, Ohio. Sixteen spindle speeds ranging from 14 to 450 r.p.m. and sixteen table feeds ranging from ¾ to 30 in. per min. are important specifications. The latter are changed by an automatic power shift mechanism controlled from either the front or rear. To change speeds, it is necessary to shift the lever located at the front of the knee (rear of the box at the side of the machine) to the left, with the starting lever in stopped position, until the desired speed on the upper revolving colored dial appears opposite the arrow. Engaging the starting lever gives the speed selected. Changing the feeds requires only the shifting of the same lever to the right, until the desired feed on the lower revolving colored dial appears opposite the arrow.



Having the same general features as the No. 3 machine but larger size, the Cincinnati Milling Machine Company has added the No. 4 plain (illustrated) and universal models to its line

Independent directional control levers for cross, vertical, and longitudinal movements of the table are provided. Each of the movements also has power rapid traverse with the spindle stopped or running. The rates are: longitudinal, 100 in.; cross, 50 in., and vertical, 50 in. An automatic trip out for the power quick traverse is provided on the plain machine, by having a flipper dog mounted on the side of the table to actuate a plunger connected to the hand lever. Rear hand adjusting cranks are provided for getting cross and vertical adjustments the same as are found at the front of the machine.

Lubricant is supplied to the mechanism within the column by means of a geared pump located inside. Automatic lubrication by the use of a pump is provided for the knee, while the one-shot system is used for the saddle and the table ways.

Anti-friction bearings are used throughout the spindle drive. A double mounting of anti-friction bearings both front and rear on the spindle, with a floating rear bearing are used.

The rectangular overarm has been increased in size, and two aluminum arbor supports are provided. The latter are self-oiling. In addition, simplified overarm braces are standard equipment. These are light and need not be removed when making a vertical adjustment.

No universal joints are employed. The vertical drive shaft is inclosed, which adds to the safety of the operator. The cutter coolant pump is of 8 gal. capacity. The coolant drains from the table into the saddle through a large opening in the back. A cored passage in the saddle carries it over to a pocket on the side of the knee, from whence it drains into the base through the telescopic tube.

The leadscrew construction has been improved, the screw itself being larger in diameter and having a longer bearing in the nut. The ends are mounted in single roller bearings.

A single-piece type elevating screw is employed, eliminating the sleeve. The thread bearing of the nut has also been increased. Among the other general improvements are increased size of the column and knee, and narrow guides.

Equipment for the plain machine consists of an arbor tightening rod, belt guards (when belt drive is used), arbor supports, arbor support bushing adapter M-01, wrenches, an 8-gal. capacity, geared coolant pump, and No. 5 plain vise.

For the universal machine, besides the above equipment, are supplied a 9-in. universal 3-jaw chuck and flange, a 14-in. dividing head, change gears, a segment, and a steadyrest.

Specifications of the No. 4 Cincinnati Milling Machine

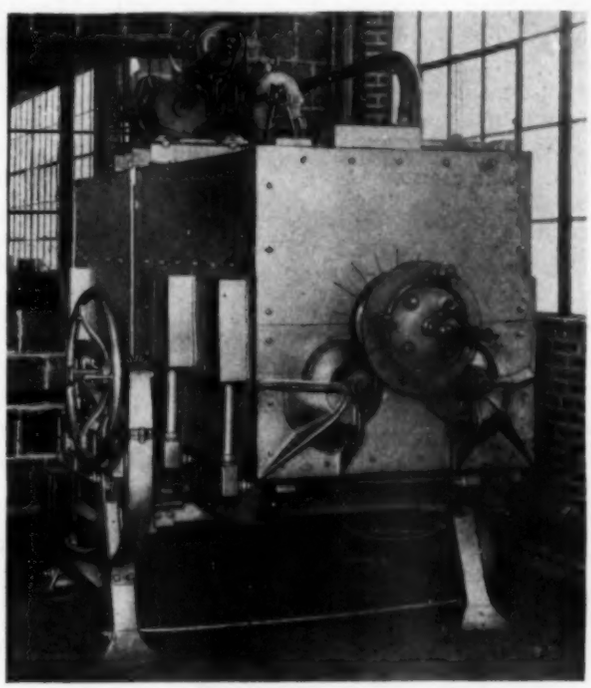
	PLAIN	UNIVERSAL
Table working surface, in.	75x16	75x16
Range:		
Longitudinal, in.	42	42
Cross, in.	14	14
Vertical, in.	20	19
Motor recommended	10 hp., 1,750 r.p.m.	same
Net weight:		
Belt drive, lb.	8,400	8,700
Motor drive, lb.	8,500	9,000
Floor space, in.	116x138	116x138

"Hevi Duty" Rotary Retort Furnace for Pressure Carburizing

AN ELECTRIC furnace for pressure carburizing has been placed on the market by the Hevi Duty Electric Company, Milwaukee, Wis. It is of the rotary retort type and has been licensed under U. S. patents by the American Gas Furnace Company, Elizabeth, N. J. The furnace illustrated is of the 600 lb. size. Sizes are also furnished up to 1,200 lb. capacity. They are sturdily constructed, having a reinforced and insulated steel shell mounted on steel legs with an operating mechanism that permits tilting the unit backward and forward to facilitate charging and discharging. Insulated plugs are used to close the retort both front and rear, being easily removable for free access during loading and unloading.

Heating elements are mounted on all four sides of the furnace chamber, and are of the round rod nickel-chromium type. These elements are mounted in radiant-type refractories, and are readily removable. Three zones of control are provided to secure an even temperature throughout the length of the retort. Instruments for this control are mounted on the furnace casing and the wall.

"Pyrofax" gas under pressure is normally used, and is cracked into hydrocarbons and absorbed by the steel charge. Artificial and natural gas, as well as carburizing compound, may be used as readily. The case is uniform on the parts treated, and with ordinary normalized carburizing steels, a penetration of $\frac{1}{16}$ in. in 5½ hours takes place at 1,675 deg. F. The furnace may also be used for hardening operations, and has successfully nitrided steel bars of dimensions that would ordinarily require a furnace chamber of extreme length and small diameter. The rotation of the retort can be varied between such wide limits that denting or disfiguring of the work is eliminated.



A 600 lb. capacity Electric Rotary Retort Furnace for Pressure Carburizing, as announced by the Hevi Duty Electric Company. Other sizes up to 1,200 lb. capacity are available

Bausch & Lomb No. 32 Shop Microscope

For the inspection of surfaces for quality, texture, cracks, or flaws, particularly in the shop, a No. 32 microscope has been placed on the market by the Bausch & Lomb Optical Company, Rochester, N. Y. This instrument is small, portable, and inexpensive. It is suitable for rapid examinations or measurements of surface characteristics and has a scale in the eyepiece calibrated in thousandths, the scale being sufficiently large that a quarter of a thousandth can be estimated with ease. The microscope may be used for examining the edges of cutting tools for smoothness and finish; for examining a surface for cracks, flaws, and blow holes; for measuring the diameter of small holes and diameter of impressions in Brinell tests.

Bausch & Lomb No. 32 shop microscope for examining cracks, flaws, and blowholes and other characteristics of a surface. To a quarter of a thousandth can be estimated

Inspecting a cracked forging with a Bausch & Lomb No. 32 shop microscope

This small microscope is built with sufficient strength and simplicity for the use of the average shop and factory foreman or superintendent. It is simple to use, it being only a matter of placing the base of the instrument on the surface, pressing the illuminator button, and looking into the eyepiece to examine and measure surface characteristics. It magnifies 40 times and has a field up to $\frac{7}{32}$ in. The micrometer eyepiece affords a ready means for measuring the extent of imperfection, or comparing characteristics, and putting the imformation obtained on a definite quantitative basis.

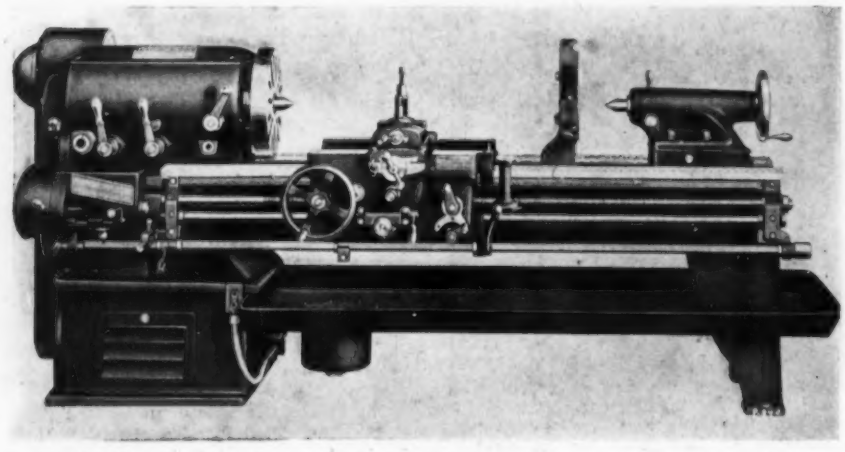
Reed-Prentice 16- and 20-Inch Sliding-Gear-Head Lathes

ESPECIALLY adapted to make use of tungsten-carbide at speeds up to 1,250 r.p.m., a 16-in. heavy type and a 20-in. regular type have been added to the line of sliding-gear-head lathes manufactured by the Reed-Prentice Corporation, Worcester, Mass. Most of the features are the same as the 14- and 16-in. regular types announced on page 388, Vol. 72, of the *American Machinist*. Among these similar features are a four-bearing Timken spindle mounting, a twin-disk clutch and brake, a quick-change gear box offering 41 changes of feeds and threads, a heat-treated, chrome-vanadium spindle, headstock gears of nickel-chrominum S.A.E. 3250 steel, and a one-piece box casting for the double-support type apron.

A 15-hp. motor, running at 1,800 r.p.m., can be used, and is of the a.c. type, giving evidence of the rigidity of these sizes. Drive from the motor to the headstock is by means of a silent chain. The motor is attached to a hinged bracket with a screw adjustment for the chain tension. Either flat or multiple V-belt drives can be furnished in place of the chain if desired.

Specifications of the 16-in. heavy lathe are as follows: Swing over bed, 17½ in.; swing over compound rest, 10¾ in.; swing over taper attachment, 9¼ in.; swing over rear connected rests, 8 in.; distance taken between centers, 6-ft. bed, tail-stock flush, 24 in.; steadyrest capacity, 6 in.; tool-post capacity, ⅝ in. x 1¼ in.; hole through spindle, 1½ in.; taper-hole in spindle, No. 5 Morse; spindle speeds, 8, range, 12 to 405 r.p.m. in geometric progression; floor space, 6 ft.bed, 8 by 3½ ft.; weight, net, 3,750 pounds.

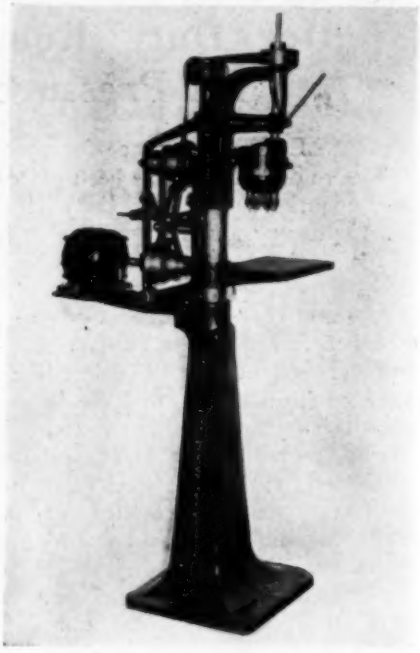
Specifications of the 20-in. lathe: Swing over bed, 21½ in.; swing over compound rest, 15¼ in.; swing over taper attachment, 13¾ in.; swing over rear connected rests, 12½ in.; distance taken between centers, 8-ft. bed, 48 in.; steadyrest capacity, 6 in.; tool-post capacity, ¾x1½ in.; hole through spindle, 1½ in.; floor space, 10 by 3½ ft.; weight, 4,100 pounds.



A representative model of the Reed-Prentice Sliding-Gear-Head Lathe offered in 14-in., 16-in. regular, 16-in. heavy, and 20-in. sizes

Landau Combination Drilling and Tapping Machine

Four spindles are located in the head of the combination drilling and tapping machine announced by the Landau Machine & Drill Press Company, 200 Broadway, New York, N. Y. These spindles may be divided two and two for drilling and tapping, or three and one for the same operations, or only one spindle need be used with the others out of action. Each spindle, moreover, has independent adjustment, and can be started or stopped very quickly.



Landau Combination Drilling and Tapping Machine, which is provided with a four spindle indexing head to be used for single- or multiple-operation jobs

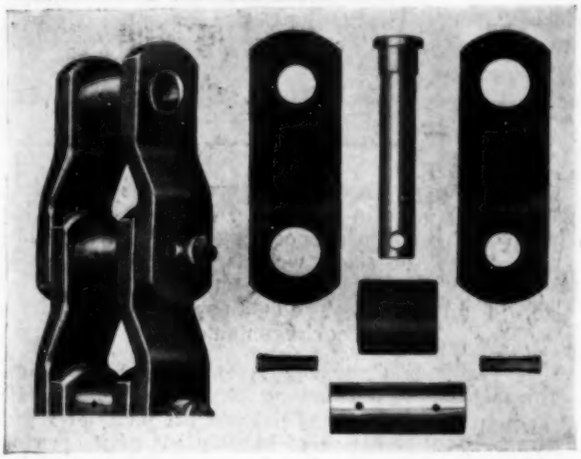
For repetition work, the head may be indexed. Before the spindle is in alignment with the work, a centering device prevents the feed lever from operating. It is claimed that the tapping spindles are very sensitive in operation. An arrangement is provided whereby when a tap strikes the bottom of the hole it reverses automatically.

The upper driving pulley is mounted on a ball-bearing eccentric shaft adjustable for taking up the slack. Quick speed changes are effected by means of the positive lever shifter without stopping the machine.

Specifications: Spindle taper, No. 1 Morse; chuck capacity, 0-¼ in.; height of machine, 62 in.; weight, 300 lb.; motor, ¼ hp.; table size, 9 x 13 in.; floor space, 20 x 34 in.; travel of table, 7 in.; speeds of drilling spindles, 650 r.p.m., 1,100 r.p.m., and 1,800 r.p.m.; tapping speeds, 110, 190, and 310 r.p.m.; travel of main drive spindle, 3 in.; travel of drilling spindle, 2 in., and travel of tapping spindle, 1 inch.

Link-Belt "Hyper" Chain

A durable heavy-duty type of chain for positive drives has been announced by the Link-Belt Company, Indianapolis, Ind., under the



Assembly of "Hyper" Heavy-Duty Chain and its various parts, announced by the Link-Belt Company

trade name of "Hyper." The chain is made from alloy steel, heat-treated, and uses a special type of pin and cotter. The pins, bushings, and holes in the side bars are accurately ground and the cotters are of a special type designed so as not to work loose when once inserted. They are expanded into the holes provided in the pins.

It is claimed that the chain combines great strength and durability. The Hyper SS-40 chain has an ultimate strength of 75,000 lb. and the SS-124, an ultimate strength of 150,000 lb. The tolerances are held to 0.001 inch.

General Electric Photo-Electric Relay

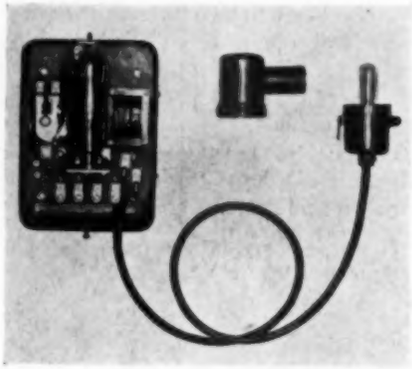
The interruption of a beam of light controls the operation of industrial machinery and other devices by utilizing of a photo-electric relay, announced by the General Electric Company, Schenectady, N. Y., as an addition to its standard line of control equipment. The relay is essentially a vacuum tube device, and uses both the photo-electric tube and the pliotron.

Many industrial or other operations in which a change of light is involved can be controlled by the relay. In addition, many operations which can be arranged to cause a change of light can be so controlled. A machine, for example that travels in a certain direction for a certain distance, and is then stopped or reversed, is a typical application. When the traveling mechanism reaches its limit, it would interrupt a beam of light falling on the photo-electric tube and thus cause the control device to function.

The relay bears the designation CR-7505-A-1. The company lists the following advantages resulting from its use:

1. It operates without shock or resistance to the progress or movement of the object which actuates it, or without impairing the accuracy of delicate mechanisms.
2. It can be located remotely from the equipment controlled, thus permitting mounting in small spaces around automatic machinery.
3. It is adjustable in sensitivity.
4. It is easily installed, and its operation is easily adjusted or changed.
5. It can be operated at high speeds, 100 times a minute being an approximate maximum.

The standard electric supply for the relay is 110 to 120 volts, 60 cycles, alternating current.



General Electric Type CR-7505-A-1 Photo-Electric Relay which may be used to control industrial machinery

Finishing Ford Pistons to Specified Weight

Pistons for Ford cars and trucks are being finished automatically to within very close limits as to weight on the machine developed for the purpose by the Ford Motor Company. The aluminum pistons, completely finished except for weight, reach the machine shown in the foreground. They leave it weighing within two grams of the specified amount.

The operator places a piston upon a delicate scale to determine the amount of its overweight. On top of the machine is another scale, which is in mechanical contact with a so-

Part of a line of boring machines used in the Ford Motor Company's works for finishing pistons within two grams of the specified weight

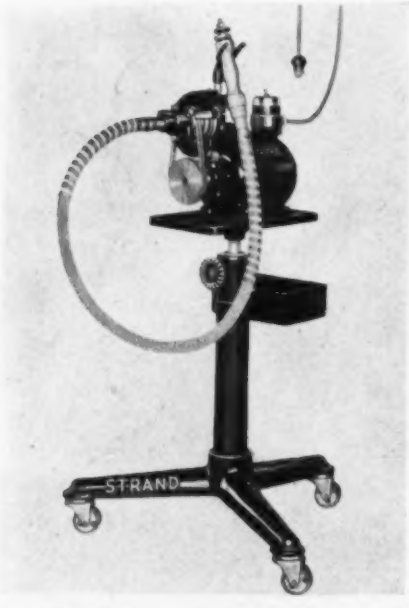
called "chip cup," shown on the chute at the lower part of the photograph.

The operator sets the machine scale to a reading corresponding with the overweight of the piston. The piston is then placed in position, the machine started, and metal chips bored from the inside of the piston drop into the cup. When the weight of the chips equals the overweight of the piston, the boring stops automatically. The whole operation takes only a few seconds.

Strand Type M5-A, 1/3-Hp., Flexible-Shaft Machine

Ball bearings are used on the motor, countershaft and hand spindle of the ⅓-hp., Type M5-A, flexible-shaft machine built by N. A. Strand & Company, 5001 North Lincoln St., Chicago, Ill. This machine is mounted on a substantial tripod base with toolbox and swivel baseplate. Vertical adjustment up to 9 in. is provided. The speeds are 900, 1,800 and 3,600 r.p.m. Grinding wheels up to 5 in. diameter and ¾ in. thickness are carried.

The flexible shaft machine is provided with a belt guard and a shaft holder. The flexible shaft is 5 ft. long, and has a vulcanized covered casing with metal switch, cord, and plug. It is furnished in either 110 or 220 volt, 60-cycle, single-phase a.c. or 110 or 220-volt d.c. models. Other models can be supplied to suit customer's requirements with respect to voltages.

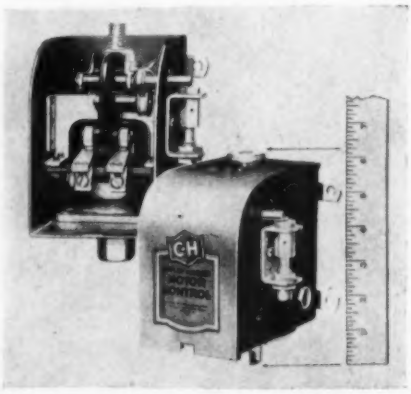


Grinding wheels up to 5 x ¾-in. can be carried on the Strand Type M5-A, ⅓-Hp., Flexible-Shaft Machine

Cutler-Hammer Small Pressure Regulator

A single-pole pressure regulator, exceptionally small in size, is announced by Cutler-Hammer, Inc., 2 12th St., Milwaukee, Wis. This device, designated as Bulletin 10,006, can be used as a starting switch for motors up to one horsepower, 230 volts, a.c. or d.c., or as a pilot switch in the control circuit of automatic starters for larger motors. The regulator closes the circuit at low pressure and opens the circuit at high pressure. It can be adjusted to open the circuit at any pressure from 30 to 200 pounds.

Applications range over a wide field; it can be used for maintaining pressure on systems containing water, air, gas, and other fluids. For air compressor service, a small unloader device at the side of the case removes back pressure.



Cutler-Hammer Bulletin 10,006 Pressure Regulator for regulating pressures from 30 to 200 lb. per sq. inch

To withstand moist atmospheres, the inclosing case is black japanned and metal working parts are cadmium plated. Double-break silver contacts prevent pitting and insure good contact. The diaphragm is of rubber. Conduit knockout holes in the case facilitate wiring.

The illustration shows that the pressure regulator is of small overall dimensions, being only 6¼ in. in height.

TRADE PUBLICATIONS

CHAIN, WELDED. The American Chain Co., Inc., Bridgeport, Conn., has published booklet No. 404, giving tables of sizes, weights, loads, and how to take measurements when specifying chain. The data apply to welded chain. This booklet contains 31, 8½x11-in. pages.

CONVEYOR APPLICATIONS. Mechanical Handling Systems, Inc., Detroit, Mich., has published a pictorial representation of installations of its product in a booklet known as "Conveyor Applications." Sixty-seven 8½ x 11-in. pages are devoted to three classifications—transportation, assembly and process. Each page contains two large photographs. Thus the catalog gives an unusual amount and variety of information.

GENERAL ELECTRIC PUBLICATIONS. The General Electric Co., Schenectady, N. Y., has published a series of bulletins as follows: No. 556C, superseding 556B, on an automatic welding head and control; No. GEA-995A, superseding GEA-995, entitled "Arc Welding in Industry"; No. GEA-1117 on solid-shaft, vertical induction motors of the "500 series"; No. GEA-1157A, superseding GEA-1157, on strip heaters; GEA-1202 on the type RKS capacitor motors; No. GEA-1236 on Fabroil gears; No. GEA-1242 on Textolite gears, and No. 1247 on the Type CR-1026 inclosed starting rheostats for repulsion-induction motors.

PUMPS, COOLANT. The Ruthman Machinery Co., Cincinnati, Ohio, has issued Catalog 1930, "Gusher Coolant Pumps," describing the various models manufactured, and showing the various types of machine tools to which they may be applied. Specifications for each type are included. The booklet contains 40, 8½x11-in. pages.

PYROMETERS. The Illinois Testing Laboratories, Inc., 141 W. Austin Ave., Chicago, Ill., has published a bulletin of interest to users of white metals, inasmuch as the pyrometers described are suitable for a low range of temperatures. This bulletin is No. 527, and is entitled "Points the Way to Better Printing."

The Whiting Limited. The Whiting Corporation, Harvey, Ill., has published for April the first issue of its railroad newspaper house organ entitled *"The Whiting Limited,"* which is published monthly and will be mailed to railroad officials.

NEWS
OF THE WEEK

Trade Practice Commission Watches Its Step —Who Will Succeed General Williams

By Paul Wooton
Washington Correspondent, American Machinist

WASHINGTON, D. C., April 30—To forestall the possibility of a breakdown in its trade practice conference system, the Federal Trade Commission has taken action that, while restricting its usefulness, preserves the integrity of the plan by which many and various industries are seeking to rid themselves of unfair and uneconomic practices. Commissioner William E. Humphrey frankly explains that the Commission has decided to exclude from all trade practice codes in the future rules which, it has been advised, are being abused, although it has no evidence of its own of such abuse.

Whether at the prompting of the Department of Justice or of its own conscience, the fact is that the Commission has simply resolved to play safe in its trade practice conference work by sticking a little closer to the interpretations that have been placed on the anti-trust laws by the courts. It has no desire to become involved in complications that may be caused by trade groups which may use rules adopted in trade practice conferences as a cloak for curtailing production, fixing prices, dividing markets, and for other restraints on trade.

Speculation on the appointment of a successor to Major General C. C. Williams as chief of Ordnance points to the selection of Col. W. H. Tschappet, now on duty in the Philippine Islands, but there are several others who are still regarded as likely nominees. An announcement is not expected until Secretary of War Hurley recovers from his present illness. Advocates of the industrial preparedness program which has been carried forward since the war under General Williams' direction are hopeful that Brig. General C. L'H. Ruggles will receive the appointment. General Ruggles is generally credited with having been primarily responsible for the vigorous prosecuting of this policy. Brig. General Samuel Hoff, chief of field service, is the senior candidate for appointment who is still eligible under the retirement law. Others also regarded in the running are Col. E. D. Bricker, Col. E. P. O'Hern, and Col. H. W. Schull. In addition to General Ruggles there are several others, including Col. Joyes, now commanding officer at the Springfield arsenal, who may be disqualified because they will reach retirement age before the usual four-year term as chief of ordnance expires.

Electrical machinery and appliances have been placed at a tariff rate of 35 per cent ad valorem by the conference committee which now has finished the commodity schedules, setting nearly all the tariff rates in essentially their final form. Electrical machinery and appliances have been entered usually under a basket clause at 40 per cent; sometimes at 30 per cent if classified as machinery. Thus the 35 per cent rate proposed is no drastic change.

The German Machinery Manufacturers' Association (Verein Deutscher Maschinenbau Anstalten) has just furnished statistics showing German exports of machinery as "Reparations in kind" for the year 1929, from which it is to be noted that in 1929 German machinery exported as reparations had a total value of 108,241,000 Reichsmarks ($25,772,182), an increase of approximately 122 per cent over the 1928 figure of 46,889,000 Reichsmarks ($11,187,715), according to Trade Commissioner James E. Wallis, Jr., Berlin, in a report to the U. S. Department of Commerce. The greatest gain was to France and her colonies. During 1928, machinery having a total value of 26,787,000 Reichsmarks ($6,391,378), was shipped as reparations in kind to continental France, including Alsace Lorraine. In 1929, this had increased to 76,126,000 Reichsmarks ($18,125,601), representing an increase of roughly 185 per cent over the previous year.

Other large gains were to Belgium, Italy, Yugoslavia, Portugal, and Japan. Reparations in the form of machinery to French West Africa rose abruptly from 13,000 Reichsmarks ($3,102) in 1928 to 2,807,000 Reichsmarks ($668,347) in 1929.

Economists who are apprehensive lest the stock market get out of hand believe that institution can expedite business recovery if it can be kept within bounds. Higher levels of prices mean that the stock market begins pouring out purchasing power but the more important influence is the psychological effect of a strong market.

As returns begin to trickle in as to the state of business during the first month of the second quarter, it is apparent that some disappointment is in store. This, in itself, may exert a sufficiently sobering effect on the market to prevent excesses. Some of the buying doubtless has been based on the hope that the wave of easy money would be sustained by a wave of increased business, but evidently such expectations are not materializing.

March exports of machinery and vehicles remain under the $100,000,000 mark, but the value of March exports was more than $6,000,000 greater than those in February. The value of exports in March, 1929, however, was $42,000,000 greater. The slump in exports seems to have affected but little the movement abroad of electrical machinery and apparatus. The same is true of industrial machinery; of construction and conveying machinery; of mining and pumping machinery; and of power-driven metal-working machinery. The decline was more noticeable in other metal-working machinery, in textile and shoe machinery, in sewing machines, and certain types of industrial machinery.

* * *

Machine Tool Builders Confer on Costs

In the absence of C. A. Johnson, president, Ernest F. DuBrul, general manager of the National Machine Tool Builders' Association, opened a two-day conference on cost accounting at the Hotel Cleveland, Cleveland, Ohio, on April 22, and immediately turned the meeting over to A. E. Grover, cost consultant of the Association. Approximately 150 cost accountants and executives were in attendance. Spirited discussion and a more marked desire to achieve uniformity in accounting methods featured the entire meeting, which was brought to a close by a joint banquet with the Cleveland chapter of the N.A.C.A. Mr. DuBrul was the speaker of the evening, his subject being "Cost Records as an Aid to Selling."

The subjects discussed in detail were: Labor Costs, Marketing Costs, Burden Distribution, Scrap and Returned Goods, Engineering and Pattern Costs, Production Costs, and Packing and Shipping Costs.

* * *

A GENERAL conference on abrasive grain sizes will be held on Thursday, May 8, at 10 a. m. in room 301 of the Industrial Building, Bureau of Standards, U. S. Department of Commerce.

Exhibit of Old Machine Tools Planned By Museum of Peaceful Arts

AN EXHIBIT seeking to acquaint the gneral public with the significance of machine tools in the world's economic and social structure will be held this fall in New York City by the Museum of the Peaceful Arts, it is announced by representatives of the Museum. The exhibit will be of an historical character, tracing the progress made in the manufacture of machine tools from the days of Wilkinson, Maudslay, Nasmyth, and other English machine tool builders, through the origin of the industry in the United States and its subsequent development up to modern times.

The Museum, which was established in 1912 through a bequest in the will of Henry R. Towne, is one of the outstanding industrial museums of the world. Its purpose is to serve as an instrument of popular industrial education. The Museum shortly is moving to larger quarters in New York City and the special machine-tool exhibit is in commemoration of this expansion.

It is the purpose of the forthcoming special exhibit to display, in the form of actual historical machines, all outstanding machine-tool developments since the origin of the industry. Some of these tools are already included in the permanent collection of the Museum, while various machine tool manufacturers and other companies and individuals have offered either to donate outright or lend to the Museum for the two or three months duration of the special exhibit various old machine tools in their possession. A number of significant developments, however—particularly those of the earliest days—are still lacking, and efforts are being increased to obtain specimens of these early machine tools, in order to insure complete representation for the exhibit.

A list is appended of some of the machines which are being sought by the Museum. Readers who have in their possession or know of the possible whereabouts of any of these machine tools or any other old machine tools which they believe of possible interest to the Museum, are urged to communicate immediately with Roberts Everett Associates, 225 West 34th St., New York City, who are assembling the special exhibit in behalf of the Museum of the Peaceful Arts.

The list, in chronological divisions, follows:

BEFORE 1820. Any existing machine tools or parts.

1820-1850. Lathes, bevel gear cutter, screw-making machine, and index milling machine.

1850-1880. Profiling machine, linear dividing engine, cylindrical grinder, universal grinding machine, and spiral gear planer.

1880-1914. Vertical boring and turning mill, gear shaper, Rogers Bond comparator, multiple spindle machine, planer type of milling machine, broaching machine, bevel gear generating machine, internal grinder, hobbing machine, and a die-cutting machine.

* * *

F. H. Payne Named As Aid to Hurley

Frederick Huff Payne, chairman of the board of the Greenfield Tap & Die Corporation, Greenfield, Mass., of which he has been an executive since its organization, has been appointed Assistant Secretary of War by President Hoover. Mr. Payne began at the

time of the organization of the Greenfield company as treasurer in 1912, and has successively held the positions of vice-president, general manager, and president of the corporation. He is also a director in several other important companies. At the outbreak of the World War, Mr. Payne was appointed a major in the Ordnance Department of the Army, in charge of procurement activities in the Bridgeport district. Since 1923 he has been the assistant district chief of the Bridgeport Ordnance District, and this has brought him in close touch with many of the problems of the War Department, especially in connection with its munitions program. As the Assistant Secretary of War, Mr. Huff will have supervision over the procurement of all military supplies and all matters pertaining to industrial preparedness.

* * *

Prizes Offered for Waste Elimination

As a means of stimulating active interest of industrial workers in the problem of waste elimination, the advisory board of the National Industrial Equipment Exposition is sponsoring a competition for the best suggestion or idea for "Waste Elimination" advanced by an employee. The awards will be in the nature of two prizes: a cash award of $50 to the employee submitting the best letter on the subject, and a certificate to the plant where he is employed. The suggestions must be in the hands of the award committee by midnight of May 30. All suggestions are to be mailed to the National Industrial Equipment Exposition, 308 West Washington St., Chicago. The basis of the award is to be on the practical use of the suggestion to American industry and the quality of the suggestion. Any company is eligible to send in three suggestions from employees for consideration. The suggestions should be covered in an article of not more than 300 words.

* * *

Foundry Equipment Orders Show Slight Decline

The index of gross orders for March in foundry equipment is reported as 164.1 by the Foundry Equipment Manufacturers Association. This compares with 196.4 for February, 1930, 160 for January, and 209.4 for March of last year. The three months' average of gross orders dropped from 188.1 in February to 176.9 in March, as compared with 195.6 in March of last year. Shipments, meanwhile, increased from 169.6 in February to 194.5 in March, as compared with 197.5 in March of last year. Unfilled orders, meanwhile, dropped from 424.7 in February to 411.1 in March as compared with 414.4 in March of last year. The basis for all these indexes is the average monthly shipments for 1922-1924 taken as 100.

* * *

Foremen to Meet In Toledo on June 6

The Foremen's Club of Toledo, Ohio, will be host to the Seventh Annual Convention of the National Association of Foremen to be held in that city on June 6 and 7. Important items in the program include visits to more than 25 plants in Toledo, a talk on "Budgeting for Profit"; another on "Operation and Program of a Foremen's Club," and one on "Creating and Maintaining Profits."

* * *

Square D Company Makes Staff Changes

C. E. Cook, formerly sales manager at Detroit for the Square D Co., Detroit, has become assistant sales manager in charge of sales of all meter and entrance switches. E. L. Pittenger moves up to assume the duties of assistant sales manager in charge of sales of industrial safety switches. Mr. Pittenger was formerly branch sales manager at Pittsburgh. R. M. Heasley will become Detroit branch sales manager. He was formerly sales representative at Grand Rapids, Mich. George H. Schubert, formerly sales representative at Detroit, fills Mr. Heasley's position at Grand Rapids.

French Industry Still Marks Time As Exports Continue to Decline

By Our Paris Correspondent

THE French economic situation is based on the same factors which have brought about a reduction in purchasing, if not consuming, power in many basic commodities. It is the French opinion that this situation is world-wide.

The tariff question was apparently slumbering until the "Tariff Holiday" proposition was broached by the League of Nations. This has set all the European world on its toes to see where, and to what extent, they can rush in with increased tariffs while the question is pending. Of itself this has done little to stabilize industry. The unemployment problem as well is evident, but in France it has not made itself felt to the extent that it has in Germany, Great Britain, or even in the United States. Official figures do not indicate it, though in many industries there is unquestionably much more short time than is commonly admitted.

If anything is a real indication of a slowing down of French industry, it is the drop in exports, the increased imports of manufactured goods of certain categories and the drop in imports of "materials necessary for industry." This is reflected in the manifests of ship cargoes inwards and outwards, and even more vividly expressed in the falling off in railway receipts within the country since the first of the year.

The metal fabricating and transforming industries have been less touched than the luxury industries and agriculture. The salvation for France, when it can be done, is the putting of the agricultural and industrial elements of the country into harmony with each other.

The annual Lyons Technical Fair, which seeks to compete with that of Leipzig, opened on March 1 with a greater number of exhibitors than ever with visitors registered from most European countries. The attendance the first day was 25 per cent greater than that of last year. It would be futile to attempt to mention, or classify, the American machinery and tool exhibits, since they were distributed through the stands of representatives in France, thus losing a good part of the psychologic effect of a national presentation. Naturally, the same national appeal bulks largely when a French maker presents a similar machine or tool under the tricolor trade-mark. There seems no way to obviate this or even improve the situation except by a concerted national action on the part of American manufacturers who may do business in France. The French distributor of the American product knows his business well enough and would not be averse to anything in the nature of increased and improved co-operation.

The automobile is as active as circumstances would seem to justify, but it is evident that for the time being there is little disposition for French makers to branch out further until the position of the United States industry is focussed. There is fear that "dumping" in some form or other, call it by what name you will, is likely to develop from that source in an effort to bring 1930 production back to the level of 1929. The estimation may be different when seen from the American side of the water.

The answer, reiterating it again and again, is a "more thorough rationalization of French industry, including the acquisition of raw materials on a stabilized basis for as far ahead as possible and the installation of advanced types of machinery in gangs, to which units may be added as needed."

French imports from foreign countries fell off nearly 5 billion francs in value in 1929, and likewise, exports showed a drop of 2½ billion francs. The greatest increase of imports was from the United States and Germany. Exports fell off to Germany, remained virtually stationary to the United States, and dropped again to Great Britain. A curious coincidence is gathered from figures of the trade relation of France and the Russian Soviet Republic. On the French side, imports amounted to 787,019,000 francs in 1929, this being practically the same as in 1928. Exports in both years approached a quarter of a billion francs.

* * * *

British Industries Show Decline But Spring Brings Reassurance

By Our London Correspondent

THE long-desired improvement in the general industrial and commercial situation is still postponed. The increased prosperity which was anticipated this time last year has failed to materialize and official returns have been showing increases in unemployment. Special causes for this may have arisen from administrative changes and the operation of a new insurance act. Even with these facts taken into account, however, it is evident enough that unemployment has increased steadily, and of late, rapidly. The position is worse than for seven or more years and no immediate improvement is anticipated.

Money is cheap and that this condition will continue is thought likely. It is even anticipated that, as the government can borrow at low rates, it will afford some relief for tax-payers, that is, on interest paid on national floating indebtedness. The cheapening of money may be supposed to arise from the fact that the demand for trade or similar purposes is small. The low rate at which the government can borrow, the exchange rates, and the gold position are favorable points, but we are being reminded that though money may be cheap, leading to lower overhead charges, this cheapness is not fully represented in the rate demanded from the ordinary industrialist when borrowing, as the banks here insist on 5 per cent as minimum interest on overdrafts.

That there has been a manufacturing decline may be gathered from the figures available regarding the production of pig iron and steel, which, after rising for the first six months or more of 1929, has since fallen away. The figures for pig iron have, in fact, for several years kept well below the pre-war average, which in 1913, for instance, was 855,000 tons a month. On the other hand, the production of steel ingots and castings has definitely increased, the 1913 monthly average being 638,600 tons, as compared with 800,000 tons at the present time. It is recognized in the steel industry that troubles are due more to war and post-war increases of productive capacity than to a decline in trade.

Until recently, iron and steel manufacturers have been regarded as moderately well employed, but, partly perhaps owing to the policy of price maintenance, pig iron stocks have tended to accumulate. Also, the shipbuilding industry needs more orders. Yet some firms have been relatively successful and a fair amount of repair work is generally mentioned. Electrical firms have formed the most prosperous section in engineering. This is due principally to home requirements and the orders given out in connection with the national schemes of distribution slowly coming into being. Of the lighter sides of engineering, one—radio—has had an unexpected setback.

The machine-tool industry is possibly not quite so well employed as it has been. The decline is relatively slight and its present condition does not bear out the oft-repeated assertion that the machine-tool trade is the first to suffer at the approach of a slump and the last to recover when trade revives. Small tools generally show something of an improvement, thus confirming the position of the machine-tool industry. The more successful firms are those with the greater enterprise. Several machine-tool firms of late have extended their factories. In particular, Alfred Herbert, Ltd., is adding four bays to the machine shop, giving it a total area of more than 8½ acres. Is this the largest machine shop in the world devoted to machine tool production?

BUSINESS · BAROMETER

Business men are more concerned about the low prices of agricultural products than about the remote possibility of another war

By THEODORE H. PRICE
Editor, Commerce and Finance, New York

AT A convention of scientists held recently, one of the speakers asserted that "Time flowed backward as well as forward," and that events which happened aeons ago were frequently caused by occurrences that were still in the future. The idea seems a big one, but it should not be incomprehensible to those who are forever trying to co-relate the future with the present and the past.

Let us take the stock market, for example. Last week it was dull, and the summer is now expected to be one of comparative quietude largely because a decline in the public purchasing power is feared as a result of the low prices at which staple farm commodities are selling, and of the partial or complete unemployment which has affected many industrial workers.

Whether the rule of three by which this conclusion has been reached has been properly applied or not remains to be seen, but it is useless to deny that the Easter holidays mark something of a change in the temper of trade, and that most merchants now express themselves as believing that the summer will be one of normal but not abnormal activity.

So far as it is discoverable the principal reason for this expectation has been a further decline in some commercial staples, and the continued depression in others. Silk, for instance, is lower than it has been since 1916, when the war menaced Japan's chief industry. Grain is also somewhat lower. There are many reasons for this, of which the newest seems to be a vague fear of a large Canadian crop.

The intrinsic value of cotton is probably unchanged but futures have declined somewhat.

Rubber is the lowest since the depression that followed the war. So is tin. Cocoa is low. Prices of many miscellaneous staples, including non-ferrous metals and chemicals, have been reduced. Sugar shows very little improvement, but trade is still more or less prostrate. The liquidation of the Brazilian accumulation will probably continue to depress coffee for some years to come. It is gradually settling down, but no sensational decline is expected.

The steel business is about as it was. Orders seem to be sufficiently numerous to keep the mills running at an average of 75 per cent of capacity for the present, but prices are easy and prospects for early expansion dubious.

It is reported that some large lots of copper were sold at last week's decline, but these sales were probably discounted in advance, and it would be a mistake to assume that copper is unusually cheap at 14 cents per pound.

The news of Easter week abroad is in the main reassuring. It is hoped that our Senate will soon ratify the Three Power Disarmament Treaty that was agreed upon in London, and that another effort will soon be made to stretch the wings of peace so that they will cover a wider area. But in America a community of economic interest is more relied upon than peace propaganda as a preventive of war, and it will be a long time before public opinion in this country will approve of another disarmament conference.

Meanwhile, our business men are more concerned about the low prices at which our agricultural staples are selling than they are about the remote possibility of another war. It cannot be said that the operations of the Federal Farm Board have been generally approved of. Higher prices for the remnant of last year's crops of wheat and cotton may have been secured as a result of the purchases made with Government money by the co-operative organizations and the grain stabilization corporation. But the problem is not that of last year's crop. It is next year's production that must be sold at remunerative prices in order to avert distress to the farmer. Just how this is to be accomplished remains to be seen. Certainly the $500,000,000 with which the Farm Board is supplied will not enable it to stabilize an agricultural production valued at from ten to twelve billion dollars. Congress might be willing to appropriate another five hundred million dollars, but it is altogether unlikely that it will supply as much as ten billions. And then to our own price problem there must be added that of the sugar growers of Cuba, the silk growers of Japan, the coffee growers of Brazil, and the agricultural producers all over the world.

It is a problem of the first magnitude. The law of supply and demand will solve it ultimately, but such a solution would cause acute distress, and it is very much to be hoped that some other method may be found for cutting the Gordian knot of overproduction.

The pity of it all is that the low prices benefit the retail consumer but little, as the increased margin attributable to the decline in the raw material is chiefly absorbed by the intermediaries, and even the farmer has to pay nearly as much for what he must buy, while accepting 20 or 30 per cent less for what he has to sell.

It is a question that calls for the attention of our ablest minds. But to say that it is unanswerable is a counsel of despair.

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From this page the reader will get a quick picture of current business and industry. The boxed material below is a summary of the letters from regional correspondents of the American Machinist, published in full on the opposite page.

SLUGGISHNESS seemed to be the prevailing characteristic in the machinery and machine-tool markets of the country during the past week. The lull is said generally to be only temporary, and most sections expect April to be the best month of the year. Inquiries have also shown a decline, but this occasions no concern, for if action can be gotten on the flood of inquiries received since the beginning of the year, dealers and manufacturers will be busy for some time to come.

NEW YORK export orders were the only things of marked interest, railroads being expected to remain out of the market for the next month. Southern District buying, on the contrary, is from railroads with some from oil-fields. Chicago reports railroads in the market there also, with agricultural machinery, tractor, household, and school interests buying.

CINCINNATI'S orders were confined to single tools and replacements, and inquiries there also held up well. New England expects a good deal of equipment to be bought for school manual training departments; standard machines are procurable from stock, and inquiries are slow. Canada reports little change, although conditions are getting better steadily and improvement is expected soon.

THE INDUSTRIAL REVIEW

Weekly progress of the machinery and machine-tool business

THE following reports, gathered from the various machinery and machine-tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

NEW YORK

General slowness has developed in the New York machinery and machine-tool market, both in orders and inquiries. No orders of appreciable size were released during the week, nor were any inquiries worth mentioning received. The only business of any proportions at present is that for export, to European countries including Soviet Russia. The railroads are not expected to do anything for at least another month.

Only one dealer reported sales as satisfactory, and these were for single items of small individual value. General feeling, however, is decidedly optimistic, and the general belief is that conditions from now on will be considerably better than they have been at any time this year. The slowness is attributed to the general lack of business for users of machine tools, and their consequent lack of interest in tools which they do not need until conditions are better.

SOUTHERN DISTRICT

The gradual improvement of the machinery and machine-tool market that has been evidenced since the beginning of the year again characterized conditions in this district as reports indicated fair April activity. The Birmingham district offered the brightest spot in the territory, while points west of New Orleans were just fair. A good quarter in the iron and steel markets in Birmingham prompts impressive speculation over the second quarter, which has already gotten fairly under way. Points east of Birmingham continue dull and the lessened buying by the railroads is being felt materially. Bright, but spotty, prospects are held out for the Florida district, which has been slow to respond to a generally improving condition.

Small-lot buying by several railroads in the New Orleans and Houston districts is reported, but there is comparatively little industrial inquiry to speak of, save for scattered orders from the oil fields. Prices for both new and used tools are firm with deliveries reported satisfactory. Used-tool business continues to dominate the market, due chiefly to replacements.

CHICAGO

The improvement in the machine-tool market situation noted a week ago is being fairly well maintained in some lines, but not so well in others. The closing on a number of items contained in railroad lists in the hands of the trade for a considerable time, and the continued issuance of new lists for railroad shop equipment has brought a large degree of satisfaction to concerns specializing in this type of machinery. In this connection, it may be stated that, with perhaps the exception of agricultural implement and tractor manufacturers, railroads have constituted the principal buying factor in the machine-tool market since the beginning of the present year. Industrial demand in general still lags, no outstanding inquiries coming from this source. Here and there an inquiry for tools needed for replacement purposes is received, but beyond that there is little activity. A Chicago concern newly organized to manufacture household utilities, principally small refrigerators for domestic use, has sent out inquiries for a number of tools needed for production purposes. The Chicago Board of Education in the last week has made additional inquiry for school shop equipment, about equally divided between metal-working and wood-working tools, which are needed for the Medill High School. Manufacturers of automobile accessories are reported as becoming more actively interested in the market. Demand for used tools is only fair.

CINCINNATI

The great majority of the machine-tool manufacturers of the Cincinnati district report that the market was very sluggish and sales were at a low level last week. One exception is a manufacturer of very large tools, who said: "We are now busier than we ever before have been, and we are operating our plant at fullest capacity." Another exception is a manufacturer of lathes, who said: "We have received a lot of orders quite recently, some from railroads and some from industrial users, and this business will keep us running full time with a full force for an extended period."

Aside from these exceptional cases, the week's orders were largely confined to single tools and replacements. The principal buyers were general machinists and miscellaneous users, located in all sections of the country, whose requirements were well diversified. While manufacturers' stocks of standard tools are not large, they are adequate to take care of the needs of customers, and shipments are, as a rule, being made without undue delay.

Inquiries flowed in freely from all sections of the country, the major portion being from general machinists and miscellaneous users, whose requirements were largely confined to single tools and replacements.

Selling agents report that the market in local and adjacent territory is very sluggish. This, it is explained, is not because modern tools are not needed by users, but because they still hesitate to make commitments. Plenty of business is pending, and ultimately sales will reach a higher level.

NEW ENGLAND

The demand for manual training equipment for school machine shops and wood-working departments in several New England cities is representative of a sizable amount of business in the aggregate. Boston will place orders at once for machinery to equip eight such departments. New prospects in this field are noted at Keene, N. H., Providence, R. I., Westfield, Quincy, and Fall River, Massachusetts.

Current developments, as a whole, were of little moment in the machine-tool market. Inquiry seemed considerably slower, while the volume of new orders only approximated the level of recent weeks. Some improvement, however, was displayed in small tool distribution with orders from a variety of widespread sources.

Industrial conditions improve slowly and steadily, but machine-tool buyers are still reluctant to place orders for needed equipment. Standard machines in many instances are procurable from stock, and delivery on high-speed production units and special machinery is practically back to normal. Back logs in leading plants are a matter of 8 to 12 weeks work at present schedules.

CANADA

While very little change is indicated in reports covering the machinery and machine-tool market in Canada during the past fortnight, the industry is holding its own, and an improvement is looked for in the near future. The ratio of output of the steel industry, which is regarded as a barometer of business, has shown a slight increase in each of the last two weeks. The revival of spring business in the motor and building products industries particularly, indicate that this improvement will continue for some time.

Optimistic statements by machinery and other metal-working concerns have featured the past fortnight. The Canada Machinery Corporation reports that the volume of business for the fiscal year ended January 31, 1930, was as large as that of previous years. The president of Dominion Foundries and Steel Ltd., speaks of the past year as the best apart from war years, and states that earnings for the first quarter of 1930 show further improvement. Orders on the books of the Canadian Blower and Forge Co., of Kitchener, Ontario, at the present time are approximately 50 per cent in excess of what they were a year ago; while Western Steel Products in the first quarter of 1930 is reported to have enjoyed a slightly better volume and more profitable business than in the corresponding period of 1929.

Owing to uncertainty as to conditions in the grain growing districts of the West, inquiries for agricultural machinery are unsatisfactory. On the other hand, however, there is a steadily increasing demand for mining machinery and hydraulic equipment.

DETROIT

Sales in the Detroit area have fallen off in the past ten days, but there are many indications that the coming month will be an unusually profitable one. Machinery and machine-tool dealers report a steady advancement of the trade over a period of six weeks, except for the slight depression of the past few days.

April sales, in general, were well ahead of those for March and a substantial improvement has been noted in the attitude of the automobile manufacturers. Production has been moving forward and many more men are employed. The whole fabric of the industrial and commercial structure has undergone a change in the last two months. Though the actual sales in most lines have not increased greatly, the atmosphere has improved considerably.

Another factor that has been significant here is replacement of stores of tools and dies. Many plants that have been using up their supplies have completely run out now and are making replacements.

The general tool shops are busy and many of them are making purchases.

In general, it can be said that the machinery and machine-tool trade is unusually sensitive and is subject to numerous fluctuations. Prospective buyers are still hesitant and are influenced by many conditions outside their businesses.

One or two good-sized deals are in prospect and many others are being worked out for the more distant future. In spite of the short lull of the past ten days the feeling here is better than it has been for a long time.

Business Items

The Dallas Brass & Copper Co., Chicago, will move shortly to its new plant and offices at 6601 West Grand Ave., on a 26-acre site. The old plant and office was located at 820 Orleans Street.

The Stevens Roller Bearing Corporation, Detroit, has been incorporated with $50,000 capital to manufacture roller bearings and other automobile parts.

The Ex-Cello-O Aircraft & Tool Corporation, Detroit, is making its sixth major plant expansion in two years. The new building, to be used exclusively for manufacturing, is to be a 55x260 ft., one-story building of steel-frame construction, and will cost $50,000.

The Bourne-Fuller Co., Unionville, Conn., has been acquired by the Republic Iron & Steel Corporation.

The Allis-Chalmers Manufacturing Co., Milwaukee, Wis., has moved its Chicago district offices to 20 North Wacker Drive, Suite 3101.

The Drese Machine Tool Co., 2415-2433 Spring Grove Ave., Cincinnati, has begun work on a new factory and office building on Beekman St. near Ralston Ave., Cincinnati, which is expected to cost $70,000.

The Goddard & Goddard Co., Inc., Detroit, has moved to 12230 Burt Road.

Grant & Wadsworth, Inc., New York, have moved their offices to the Chrysler Building.

The W. S. Tyler Co., Cleveland, is planning a plant at St. Catherine's, Ontario, to cost approximately $150,000.

Personals

WALLACE CLARK, consulting engineer of New York, Paris, Prague, and Warsaw, will return to Paris on May 7, after a month's visit to the United States. He expects to be gone for six months.

NORRIS J. CLARKE, vice-president of the Lamson & Sessions Co., Cleveland, and JOHN A. COAKLEY, traffic manager of the American Steel & Wire Co., Cleveland, were recently elected directors of the Cleveland Chamber of Commerce.

R. P. DRYER, charter member of the American Trade Association Executives, was chosen secretary of the Foundry Equipment Manufacturers' association at the recent meeting in Cleveland on April 16.

J. R. GARRISON and R. P. GARRISON will be direct managers of the Garrison Machine Works, Dayton, Ohio, J. R. Garrison in the designing, engineering, and manufacturing phases and his brother in the sales phases. Their father, Orlando Garrison, president, died recently.

RALPH F. GOW, planning engineer of the Norton Co., Worcester, Mass., has been appointed head of the production department of the Lacourneuve, (near Paris) France, plant of the company.

S. GRIFFITH has been elected general manager of E. C. Stearns & Co., Syracuse, N. Y., to succeed E. A. HURDMAN.

HENRY HAPT, who has been engaged in iron-working pursuits in Huntsville, Ala., for several years, is establishing an iron foundry there.

GEORGE GUSTAFSON, formerly a member of the Detroit branch, Kearney & Trecker Corporation, has been appointed Chicago manager.

FRANK A. HATCH has been elected a director of the Niles-Bement-Pond Co., New York, to replace JAMES J. CULLEN, retired.

M. E. LANGE, production engineer of the Warner & Swasey Co., Cleveland, Ohio, addressed the Superintendents' & Foremen's Club of the New York and New Jersey Branch, National Metal Trades Association, on April 18. Mr. Lange's topic was "Profitable Turret Lathe Toolings."

E. H. MCCARTY, who retired from the Nash Motors Co., Kenosha, Wis., a year ago, has returned to become a director, vice-president, and general manager of the company. He was in charge of sales before his retirement.

CHARLES E. MITCHELL, associate manager of the Gray Iron Institute, Inc., Cleveland, spoke on "Foundry Costs" at the regular monthly meeting and dinner of the Pittsburgh Foundrymen's Association on April 21. K. G. WOLFE, secretary-treasurer of the L. B. Foster Co., acted as discussion leader.

E. D. KILBURN, vice-president and general sales manager of the Westinghouse Electric & Manufacturing Co., has resigned. Announcement is also made

W. S. RUGG

that W. S. RUGG, vice-president in charge of engineering, will continue to hold the same position and in addition assume control of the sales policies of the company. S. M. KINTNER, manager of research engineering, becomes assistant to Vice-President Rugg on engineering supervision.

F. F. MURRAY was elected a director of the Oil Well Supply Co., Pittsburgh, at the recent annual meeting.

RALPH R. NEWQUIST has been appointed sales engineer of the Chicago office of the Reliance Electric & Engineering Co., Cleveland.

PAUL J. NUTTING has been elected president of the Lee Foundry & Machine Co., Plymouth, Mich., to succeed H. S. LEE, resigned. JOHN COLE has been appointed sales manager at the company's Detroit headquarters at 2970 West Grand Boulevard.

CHARLES R. POLLARD, formerly at the home office of the Alexander Milburn Co., Baltimore, has been appointed Chicago district representative with headquarters at 220 South State Street.

H. W. REED has been appointed works manager of the Shaw Crane Works, Muskegon, Mich., a division of Manning, Maxwell & Moore, New York City, to succeed HENRY HUSS, resigned.

FRANK RIFFLE, European director of sales and engineering in Paris for the Kearney & Trecker Corporation, Milwaukee, is returning to the United States to become Chicago office manager. WILLIAM MIRGILER, formerly Detroit district salesman, is replacing Mr. Riffle in Paris, and will sail the end of this month.

CHARLES A. ROWAN, president of the Westinghouse International Brake & Signal Co., Pittsburgh, and O. W. Buenting, general works manager, were elected vice-presidents at the recent directors' meeting of the Westinghouse Air Brake Co., Pittsburgh.

HURLBURT W. SMITH, Syracuse, N. Y., has been elected a director of the Crucible Steel Co. of America, Pittsburgh.

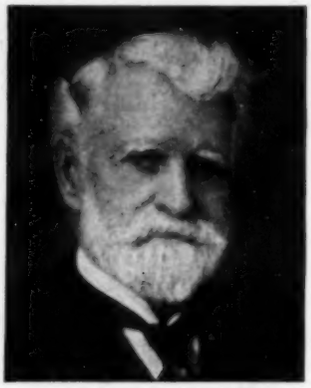
ROBERT C. STANLEY, president of the International Nickel Co., New York City, has been elected a trustee of the Equitable Trust Co. of New York.

GUY W. VAUGHAN has been elected president of the Wright Aeronautical Corporation, New York, to succeed Charles L. Lawrance. Mr. Vaughan has been vice-president and general manager for the last five years. Mr. Lawrance has been president of the company since 1925, and is now vice-president of the Curtiss-Wright Corporation in charge of research and engineering. BRUCE G. LEIGHTON was elected vice-president of the Wright company in charge of sales, and a member of the board of directors.

J. F. WALLACE, chief engineer of the Cleveland Pneumatic Tool Co., Cleveland, and designer of the first pneumatic shock-absorbing strut for aircraft, has left for Europe. He will join L. W. GROVE, acting head of the company, at Berlin, and will visit European aircraft manufacturing establishments.

ERNEST T. WEIR, chairman of the National Steel Corporation, was elected a director of the Fidelity Trust Co. of Pittsburgh recently. Mr. Weir was one of the founders of the Weirton Steel Co., now part of the National Steel Corporation, and was founder of the town of Weirton, West Virginia.

AMBROSE SWASEY, chairman of the board of the Warner & Swasey Co., Cleveland, Ohio, was recently honored by the award of the City of Cleveland's medal for public service. The award was made by the Cleveland Chamber of Commerce at its annual meeting on



April 15. Mr. Swasey's name was one of three added to the list this year. Tribute was made in connection with the award in the following citation:

Generous supporter of charitable, educational, civic and scientific institutions of Cleveland, and of the nation.

Authority on instruments of precision.

Inventor and builder of unique scientific instruments which have essentially added to human knowledge and welfare.

Holder of the highest scientific honors: Member of the National Academy of Sciences, Fellow of the Royal Astronomical Society, Chevalier Legion d'Honneur, founder-member and past-president of the American Society of Mechanical Engineers, member of the British Institute of Mechanical Engineers.

A distinguished citizen who is honored not only in this country, but also throughout the civilized world; whose character and achievements shed glory and honor upon the City of Cleveland.

EDMUND S. WOLFE, a director of the Producto Machine Co., Bridgeport, Conn., has been elected a director of the Connecticut Co., street railway utility, to succeed the late Charles G. Sanford. Mr. Wolfe is president of the First National Bank, Bridgeport, and a director of 12 other organizations.

Obituaries

A. EUGENE STARBUCK, president of the American Stainless Steel Co., Pittsburgh, died unexpectedly at his home in that city on April 15, shortly after a meeting of the agency and officers of the company.

CHARLES B. PHILLIPS, 53, general manager of the Atlantic Basin Iron Works, Brooklyn, N. Y., died at his home in that city on April 15, following an illness of about six weeks. Mr. Phillips was also a director.

FRED V. MCGRAW, 41, sales manager of the Ray Day Piston Co., Detroit, died at Mount Carmel hospital, Columbus, Ohio, following an automobile accident recently.

ELMER T. MCCLEARY, 51, president of the Republic Steel Corporation, died on April 22 after an operation. He had been ill for a week. Mr. McCleary was elected president of the new Republic Steel Corporation in December when the merger was projected by Cyrus S. Eaton and associates. He became president of the Republic Iron & Steel Co. predecessor of the Republic Steel Corporation, in 1928.

MALCOLM D. JEFFREY, 46, member of the board of directors of the Jeffrey Manufacturing Co., Columbus, Ohio, died on April 15 at Southern Pines, N. C., after a long illness.

EDWARD H. PERSONS, 79, a director of the Carter & Hakes Machine Co. of Winsted, Conn., died on April 21 in Winsted.

A. DAVID RAY, mechanical engineer and president of the Cleveland Micrometer Co., Cleveland, died on April 12 in that city.

WILLIAM BLACK, 53, president of B. F. Avery & Sons, Louisville, Ky., died on April 19 at St. Petersburg, Florida.

FRANK J. DUTCHER, 79, official of the Draper Corporation, Hopedale, Mass., died recently after a three-week illness.

WILLIAM E. BLAIR, said to have designed the first V-type motor built in America, died recently in Buffalo.

WILLIAM L. GLATFELTER, president of the York (Pa.) Machinery Co., died at Pinehurst, N. C., on April 21.

Forthcoming Meetings

AMERICAN IRON & STEEL INSTITUTE —Spring meeting at the Commodore hotel, New York, N. Y. on May 9.

AMERICAN FOUNDRYMEN'S ASSOCIATION — Annual Convention, Cleveland Public Auditorium, Cleveland, Ohio, May 12-17. C. E. Hoyt, 222 W. Adams St., Chicago, is secretary-treasurer.

STEEL FOUNDERS SOCIETY OF AMERICA—May meeting, Hotel Hollenden, Cleveland, Ohio, May 14. G. P. Rogers, 932 Graybar Bldg., New York City, is managing director.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Fifth national aeronautic meeting, May 19-21, Dayton, Ohio, and Wright field. Calvin W. Rice, 29 West 39th St., New York, is secretary.

NATIONAL FOREIGN TRADE COUNCIL —Convention at Hotel Biltmore, Los Angeles, May 21-23. O. K. Davis, 1 Hanover Square, New York City, is secretary.

SOCIETY OF AUTOMOTIVE ENGINEERS —1930 Summer Meeting, French Lick Springs Hotel, French Lick Springs, Ind., May 25-29. National headquarters are at the Engineering Societies Bldg., 29 W. 39th St., New York City.

ASSOCIATED MACHINE TOOL DEALERS —Meeting at Granville Inn, Granville, Ohio, June 4 to 5. A. G. Bryant, 2558 West 16th St., Chicago, is secretary.

NATIONAL ASSOCIATION OF FOREMEN —Convention at Toledo, Ohio, June 6-7. Harry J. Baumker, 316 Tenth St., Toledo, is convention secretary.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS — Semi-annual meeting, Hotel Book-Cadillac, Detroit, June 9 to 12. Calvin W. Rice, 29 West 39th St., New York City, is secretary.

NATIONAL ASSOCIATION OF PURCHASING AGENTS—Fifteenth annual convention, Stevens Hotel, Chicago, June 16-19. "Inform - A - Show" in conjunction. G. A. Renard, 11 Park Place, New York City, is secretary-treasurer.

STEEL INDUSTRY'S EXECUTIVES—Annual Iron & Steel Exposition. Under the sponsorship of the Iron & Steel Electrical Engineers, June 16-20, Broadway Auditorium, Buffalo, N. Y. John F. Kelly, 1010 Empire Bldg., Pittsburgh, Pa., is managing director.

WORLD POWER CONFERENCE—Second annual conference, Berlin, Germany, June 16-25. O. C. Merrill, Edmonds Bldg., Washington, is American chairman.

AMERICAN SOCIETY FOR TESTING MATERIALS—Annual meeting, Haddon Hall, Atlantic City, N. J. June 23-27. C. L. Warwick, 1315 Spruce Street, Philadelphia, is secretary-treasurer.

STEEL FOUNDERS' SOCIETY OF AMERICA—Semi-annual convention, Greenbrier Hotel, White Sulphur Springs, Va., June 26-27. G. P. Rogers, 932 Graybar Bldg., New York City, is managing director.

INTERNATIONAL CONGRESS FOR GENERAL MECHANICS — Liege, Belgium, Aug. 31 to Sept. 7. For information address Alb. Schlag, 4 Place Saint Lumbert, Liege, Belgium.

NATIONAL METAL CONGRESS—Twelfth annual Congress and Exposition, Stevens Hotel, Chicago, Sept 22-26. W. H. Eisenman, secretary of the A.S.S.T., 7016 Euclid Ave., Cleveland, Ohio, is director.

AMERICAN WELDING SOCIETY—Annual fall meeting, Congress Hotel, Chicago, September 22-26. W. M. Spraragen, 29 W. 39th St., New York, N. Y. is technical secretary.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Annual fall meeting of Iron & Steel Division and Machine Shop Practice Division, Stevens Hotel, Chicago, September 22-26. P. T. Wetter, 29 W. 39th St., New York, secretary.

AMERICAN INSTITUTE OF MINING & METALLURGICAL ENGINEERS — Annual fall meeting of Iron & Steel Division, Stevens Hotel, Chicago, September 22-26. T. T. Read, 29 W. 39th St., New York, N. Y., is secretary.

AMERICAN INSTITUTE OF MINING & METALLURGICAL ENGINEERS — Annual fall meeting of the Institute of Metals Division, Stevens Hotel, Chicago, September 22-26. W. M. Corse, 29 W. 39th St., New York, N. Y., is secretary.

AMERICAN SOCIETY FOR STEEL TREATING—Annual Convention, Stevens Hotel, Chicago, September 22-26. W. H. Eisenman, 7016 Euclid Ave., Cleveland, is secretary.

THE WEEKLY PRICE GUIDE . . .

Rise and Fall of the Market

ELECTROLYTIC copper prices have not weakened further since the drop of April 15. Naturally enough fabricated copper and brass have this week reflected the decline in raw material, at warehouses in the principal centers. Scrap metal also fell, with the result that dealers with large holdings were placed at a disadvantage. Steel buying is active at present in pipe-line and automotive material. Dullness prevails in other departments of the trade, such as, fabricated structurals and railway steel. There is cutting under in rein. bars and the base on plates and shapes is slipping from $1.80 to $1.75 per 100 lb., Pittsburgh.

(All prices as of Apr. 25, 1930)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern (silicon 1.75@2.25)	$17.69@$18.19
Northern Basic	19.90
Southern Ohio No. 2	19.90
NEW YORK—Tidewater Delivery	
No. 2 Southern (silicon 1.75@2.25)	19.50
BIRMINGHAM	
No. 2 Foundry (silicon 1.75@2.25)	15.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	21.76@ 22.26
Virginia No. 2	24.04
Basic	19.75@ 20.25
CHICAGO	
No. 2 Foundry, local (silicon 1.75@2.25)	20.00
No. 2 Foundry, Southern (silicon 1.75@2.25)	20.01
PITTSBURGH, including freight charge ($1.76) from Valley:	
No. 2 Foundry	20.26
Basic	20.26
Bessemer	20.76

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.50
Cleveland	5.00
Cincinnati	4.50
New York	5.55
Chicago	4.50@4.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots:

Blue Annealed*	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.10	3.35†	3.25	3.50@3.60†
No. 12	2.15	3.45†	3.30	3.55@3.65†
No. 14	2.25	3.55†	3.40	3.60@3.70†
No. 16	2.35	3.65†	3.50	3.70@3.80†
Black				
Nos. 18 to 20	2.35@2.45	3.85†	3.55	3.45@3.70
No. 22	2.50@2.60	4.00†	3.70	3.60@3.85
No. 24	2.55@2.65	4.05†	3.75	3.65@3.90
No. 26	2.65@2.75	4.15†	3.85	3.75@4.00
No. 28	2.80@2.90	4.75†	4.00	3.90@4.15
Galvanized				
No. 10	2.60@2.70	3.90†	3.80	3.55@3.80
Nos. 12 to 14	2.70@2.80	4.00†	3.90	3.65@3.90
No. 16	2.80@2.90	4.10†	4.00	3.75@4.00
No. 18	2.95@3.05	4.25†	4.15	3.90@4.15
No. 20	3.10@3.20	4.40†	4.30	4.05@4.30
No. 22	3.15@3.25	4.45†	4.35	4.10@4.35
No. 24	3.30@3.40	4.60†	4.50	4.25@4.50
No. 26	3.55@3.65	4.85†	4.75	4.50@4.75
No. 28	3.80@3.90	5.10†	5.00	4.75@5.00

*Light Plates. †Up to 3,999 lb.

WELDED STEEL PIPE—Warehouse discounts are as follows

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv.
1 to 3 in. butt..	56.02%	43.48%	53.3%	42.3%	57.3%	44.8%
3½ to 6 in. lap..	52. 6%	40.06%	53.3%	40.3%	53.9%	41.4%

WROUGHT-STEEL PIPE LIST

Size, Inches	List Price per Foot	—Diameter in Inches— External	Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28
8	2.50	8.625	8.071	.277

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at New York warehouse in lots of less than 100 ft. or 100 lb.:

—Thickness— Decimal	B.w.g. and Fractions	Outside Diameter in Inches ⅛	¼	⅜	½	⅝	¾	1	1⅛	1¼
		Price per Foot								
.035"	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23		
.049"	18	.17	.18	.19	.20	.21	.23	.25		
.065"	16	.19	.20	.21	.22	.23	.25	.27		
.083"	14	.20	.22	.23	.24	.25	.27	.29		
.095"	13	.21	.23	.25	.26	.27	.29	.31		
.109"	12	.22	.24	.26	.27	.28	.30	.32		
.120" or .125"	11	.23	.25	.27	.28	.29	.31	.33		
.134"	10	.24	.26	.28	.29	.30	.32	.34		

MISCELLANEOUS—Warehouse base prices in cents per lb.:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	4.65	4.65
Spring steel, heavier	4.00	4.00	4.00
Coppered Bessemer rods	6.05	6.00	6.20
Hoop steel	4.25†	4.00	3.75†
Cold rolled strip steel	6.25	6.00	6.10
Floor plates	5.10†	5.30	5.00†
Cold drawn, round or hexagon‡	3.40	3.65	3.60
Cold drawn, flat or square‡	3.90	4.15	4.10
Structural shapes	3.30†	3.00	3.10†
Soft steel bars	3.25†	3.00	3.00†
Soft steel bar shapes	3.25†	3.00	3.00†
Soft steel bands	3.75†	3.65	3.20†
Tank plates	3.30†	3.00	3.10†
Bar iron (2.75 at mill)	3.2	3.00	3.00
Drill rod (from list)	60%	55%	50%

*Flat, $\frac{3}{16}$-in. thick by $\frac{1}{4}$-in. wide. †Up to 3,999 lb., ordered and released for shipment at one time. ‡Cold finished steel, shafting and screw stock.

Electric welding wire at New York warehouse—$\frac{3}{32}$, 8.35c. per lb.; $\frac{1}{8}$, 7.85c. per lb.; $\frac{5}{32}$ to $\frac{1}{2}$, 7.35c. per lb.

METALS

Warehouse Prices in Cents Per Pound for Small Lots:

Copper, electrolytic, New York			15.25
Tin, Straits, pigs, New York			38.00@39.00
Lead, pigs, E. St. Louis	5.40	New York	6.50@ 7.00
Zinc, slabs, E. St. Louis	4.75	New York	6.25@ 7.25

	New York	Cleveland	Chicago
Antimony, slabs	10.25@10.75	11.50	14.50
Copper sheets, base	23.75	22.75	23.75
Copper wire, base	16.00	15.87½	15.87½
Copper, drawn, round, base	22.25	22.25	22.25
Copper tubing, base	26.00	26.00	26.00
Brass sheets, high, base	20.50	20.50	20.50
Brass tubing, high, base	25.50	25.50	25.50
Brass rods, high, base	18.75	18.75	18.75
Brass wire, high, base	21.00	21.00	21.00

SHOP MATERIALS AND SUPPLIES

METALS—Continued

	New York	Cleveland	Chicago
Aluminum ingots, 99%.....	25@26	24.30	24.30
Zinc sheets (casks).....	10.25@11.00	11.75	10.11
Solder (½ and ½).....	27.75	27.50	26@28
Babbitt metal, delivered in case lots, New York, cents per lb.:			
Genuine, highest grade.....			55.00
Commercial genuine, intermediate grade.....			41.00
Anti-friction metal, general service.....			31.00
No. 4 babbitt, f.o.b.....			11.25

NICKEL AND MONEL METAL—Price in cents per lb., base, f.o.b. Huntington, W. Va.:

	Nickel	Monel Metal
Sheets, full finished.....	52.00	42.00
Sheets, cold rolled.....	60.00	50.00
Strip, cold rolled.....	55.00	45.00
Rods, hot rolled.....	45.00	35.00
Rods, cold drawn.....	50.00	40.00
Tubing.....	75.00*	90.00†
Angles, hot rolled.....	50.00	40.00
Plates.....	52.00	42.00

*Seamless. †Welded.

OLD METALS—Dealers' purchasing prices in cents per pound, f.o.b. cars:

	New York	Cleveland	Chicago
Crucible copper.....	11.50@11.75	13.50	10.25@10.75
Copper, heavy, and wire..	10.25@10.50	13.00	9.50@10.00
Copper, light, and bottoms	9.00@ 9.25	12.00	8.75@ 9.25
Heavy lead.....	4.25@ 4.50	5.25	3.50@ 4.00
Tea lead.....	2.25@ 2.50	3.25	2.50@ 3.00
Brass, heavy, yellow.....	6.25@ 6.37½	8.00	6.00@ 6.50
Brass, heavy, red.....	9.00@ 9.25	12.50	8.50@ 9.00
Brass, light.....	5.00@ 5.25	7.00	5.00@ 5.50
No. 1 rod-brass turnings.	7.25@ 7.50	8.00	7.00@ 7.50
Zinc.....	2.25@ 2.50	3.00	2.00@ 2.25

TIN PLATES—Charcoal—Bright—Per box:

"AAA" Grade:	New York	Cleveland	Chicago
IC, 14x20.....	$12.10	$11.95	$11.50
"A" Grade:			
IC, 14x20.....	9.70	9.90	9.50
Coke Plates—Primes—Per box:			
100-lb., 14x20.....	6.45	6.10	7.00
Terne Plates—8-lb. Coating—Small lots—Per box:			
IC, 14x20.....	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton, waste, white, per lb.....	$0.13*	$0.16	$0.15
Cotton waste, colored, per lb....	.09½*	.12	.12
Wiping cloths, washed, white, per lb.....	.12½	38.00 per M	.16
Sal soda, per lb.....	.01¼	.02	.02
Roll sulphur, per lb.....	.028	.03½	.04
Linseed oil, raw, in 1 to 4 bbl. lots, per lb.....	.15	.164	.154
Cutting oil, about 25% lard, in 5 gal. cans, per gal.....	.75	.60	.65
Machine oil, medium-bodied (55 gal. steel bbl.) per gal.....	.33	.36	.24
Belting—Present discounts from list in fair quantities (½ doz. rolls) for leather or rubber:			
Leather—List price, 24c. per lin.ft., per inch of width, for single ply:			
Medium grade.....	30–10%	30–10%	35%
Med. grade, heavy wgt.....	30%	30 –5%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin.ft.:			
First grade.....	50%	50–10%	50%
Second grade.....	60%	60– 5%	50–10%

*Grade F.

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars.....	per lb.	$0.0325	$0.0325	$0.0325
Cold drawn shafting..	per lb.	.034	.034	.035
Brass rods.....	per lb.	.1875	.2125	.2487½
Solder (½ and ½).....	per lb.	.2775	.275	.35
Cotton waste, white..	per lb.	.13	.13	.10@.13½
Disks, aluminumoxide mineral, cloth, No. 1 6-in. dia.....	per 100	4.59	4.59	3.60
Lard cutting oil.....	per gal.	.75	.75	.55
Machine oil.....	per gal.	.33	.33	.33
Belting, leather, medium.....	off list	30–10%	30–10%	30–10%
Machine bolts, up to 1x30 in., full kegs....	off list	50–10%*	50–10%*	50–10%*

*List prices as of April 1, 1927

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials — Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
Flint paper*.....	$6.03	$6.03	$6.03
Emery cloth*.....	25.87	25.87	25.87
Disks, aluminum oxide mineral, 6 in. dia., No. 1, per 100:			
Paper†.....	2.61	2.61	2.61
Cloth†.....	4.59	4.59	4.59
Fire clay, per 100 lb. bag.....	1.00	.75	.75
Coke, prompt furnace, per net ton....	Connellsville,		2.60
Coke, prompt foundry, per net ton....	Connellsville,		3.50@4.85
White lead, dry.....	100 lb. kegs...	New York,	13.75
White lead, in oil.....	100 lb. kegs...	New York,	14.25
Red lead, dry.....	100 lb. kegs...	New York,	13.75
Red lead, in oil.....	100 lb. kegs...	New York,	15.25

*Less than 3 reams. †Less than 200.

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

Machine bolts:	
Up to ¾-in. x 6-in., full kegs, list less.....	60%
Larger, up to 1 x 30-in., full kegs, list less.....	50–10%
Less than full kegs or case lots, add to list.....	10%
Fitting-up bolts: list less.....	45%
Lag screws::	
Up to ½-in. x 6-in., list less.....	60%
Larger, list less.....	50–10%
Less than full keg or case lots, add to list.....	10%
Rivets:	
Structural, round head, full kegs, net.....	$4.50
Structural, round head, broken kegs, net.....	6.00
Tank, ⅞-in. dia. and smaller, list less.....	60%
Nuts:	
Hot pressed, square or hexagonal, blank or tapped:	
Full kegs up to 1-in., incl., list less.....	60%
Larger, up to 3-in., list less.....	40–10%
Less than keg or case lots, add to list.....	10%
Washers:	
Wrought, full kegs, per 100 lb., list less.....	$4.00
Wrought, broken kegs, per 100 lb., list less.....	2.00
Turnbuckles:	
With stub ends, list less.....	20%
Without stub ends, list less.....	50%
Chain:	
Proof coil, base, per 100 lb., net.....	$8.50
Cast iron welding flux, per lb., net.....	.35
Bronzing flux, per lb., net.....	.50

MACHINE REQUIREMENTS AND INDUSTRIAL CONSTRUCTION

Equipment Wanted

La., New Orleans—Sewerage & Water Board —traveling crane for drainage station No. 9 Cont. 113 D.

Mass., Dorchester—National Cornice & Fire Door Co., 5 Leedsville Court—punch press for die and tool work.

Mich., Detroit—Detroit Gray Iron Foundry Co., Deldrum and Jefferson Ave.—miscellaneous machinery and equipment for proposed 1 story, 115 x 170 ft. foundry. Estimated cost $55,000.

O., East Palestine—J. Valcio (manufacturers electrical goods)—two lathes, automatic machine, drill press, air compressor, etc., for recently acquired plant.

O., Williamsport—Clark Motor Sales Co., F. Clark, Purch. Agt.—small lathe, grinder and air compressor.

Ont., Welland—Canadian Mead-Morrison Co., Ltd., 317 Main St.—machinery and equipment for new machine shop.

Opportunities for Future Business

Ala., Birmingham—Sloss Sheffield Steel & Iron Co., 3131 North First Ave., awarded contract for the construction of a 1 story, 26 x 80 ft. factory.

Calif., Maywood—West Coast Separator Co., awarded contract for the construction of a 1 story, 55 x 160 ft. factory and 1 story 60 x 90 ft. warehouse at Riverside Dr. between Randolph and Slauson Aves. Estimated cost $40,000.

Calif., Pittsburg—Pittsburg School District, will receive bids until May 9 for the construction of a junior high school, including shops, etc. Estimated cost $150,000.

Calif., Whittier—State Dept. of Public Works, Div. of Architecture, Sacramento, will receive bids until May 20 for the construction of ward and shop building here. G. B. McDougall, State Office Bldg., Sacramento, Archt.

Conn., New Haven—Crawford Oven Co., 200 Sheldon Ave., awarded contract for the construction of a 1 story, 90 x 200 ft. factory. Estimated cost $60,000.

Conn., Old Saybrook—Stearns Marine Service Co., 14 Elkins St., Boston, Mass., will build a service building, including crane, office, storage building, etc. Estimated cost $40,000. Private plans.

Conn., Waterbury—Lux Clock Co., 97 Perry St., is receiving bids for the construction of a 4 story, 35 x 80 ft. factory. Estimated cost $75,000. T. M. Freney, 51 Leavenworth St., Archt. Noted Apr. 24.

Ill., Chicago—Bd. of Education, 188 West Randolph St., will receive bids until May 13 for a section of Lane technical high school at Addison and Western Aves. P. Gerhardt, 188 West Randolph St., Archt. Noted Feb. 20.

Ill., East Peoria (br. of Peoria)—Caterpillar Tractor Co., R. C. Force, Pres., awarded contract for a 1 story, 395 x 405 ft. addition to tractor factory on Washington St. Estimated cost $200,000.

Ind., Anderson—Guide Lamp Co., plans the construction of a 1 story, 200 x 520 ft. factory at Arrow Ave. and Belt R.R. Estimated cost $70,000. Work will be done under General Motors supervision.

Ind., Laporte — Lincoln Oil Co., had plans prepared for the construction of a service station. Estimated cost $44,000. Fett, Pearson & Goffeney, South Bend, Archts.

Me., Portland—Firestone Tire & Rubber Co., 1286 Main St., Akron, O., awarded contract for the construction of a 2 story, 70 x 100 ft. garage at Forest Ave. and Boulevard, here. Estimated cost $50,000.

Mass., Belchertown—Dept. of Mental Diseases, awarded contract for the construction of a 2 story industrial building at State School. Estimated cost $50,000.

Mass., Fitchburg—Crocker, Burbank & Co., Inc., 545 Westminster St., are receiving bids for the construction of plant No. 8. G. F. Hardy, 309 Broadway, New York, Archt.

Mass., Foxboro — The Foxboro Co., E. H. Bristol, Nepsonset Ave., awarded contract for a 3 story, 65 x 82 ft. addition to factory for the manufacture of gauges and thermometers. Estimated cost $60,000. Noted Apr. 10.

Mass., Lowell—Eastern Massachusetts Street Railway Co., 38 Chauncy St., Boston, is receiving bids for reconstruction of car house into bus garage here. Private plans.

Mass., Malden—Eastern Ave. Auto Parts Co., 182 Eastern Ave., awarded contract for the construction of a 1 story shop and service station. Estimated cost $40,000.

Mass., Newton—J. A. Marr, 208 Charles St., Waltham, had plans prepared for the construction of a 1 story garage and repair shop at 67 Lexington Ave. Estimated cost $40,000. Private plans.

Mass., Pittsfield—Berkshire Auto Co., 109 South St., awarded contract for the construction of a 2 story, 60 x 145 ft. repair and service garage on South St. Estimated cost $50,000.

Mass., Watertown (Boston P. O.)—Riverside Trust, 68 Main St., will soon receive bids for the construction of a 1 story garage, shop and service station on North Beacon and Court Sts. Estimated cost $50,000 Private plans.

Mass., West Gloucester—Russia Cement Co., N. C. Phillips, will soon receive bids for a 1 story machine shop on Essex Ave. Private plans.

Mass., Wrentham—Dept. of Mental Diseases, will receive bids about May 1 for remodeling service building at State school. Estimated cost $40,000. Kendall, Taylor & Co., 209 Columbus Ave., Boston, Archts.

Mo., St. Louis — Wrought Iron Range Co., 5661 Natural Bridge Ave., awarded contract for a 1 story, 30 x 118 ft., addition to stove and range plant at 5661 Natural Bridge Ave. Estimated cost $40,000.

N. J., Hawthorne (br. Paterson)—S. Braen, 115 Totowa Ave., Paterson, is having plans prepared for a 2 story, 90 x 140 ft. garage at Pasadena Ave. and Nelson St., here. Estimated cost $150,000. J. C. Van Vlandren, 140 Market St., Archt.

N. J., Kearny—Western Electric Co., Inc., O. C. Spurling, Lincoln Highway, will readvertise for bids for the construction of factory buildings 40E-41 and 42 on Central Ave. Estimated cost $500,000. Private plans. Former bids rejected. Noted Apr. 3.

N. J., Passaic—Owner, c/o B. J. Bellay, 625 Main Ave., Archt., is having preliminary plans prepared for the construction of a 1 story work shop. Estimated cost $40,000.

N. Y., Brooklyn — Wileshen Realty Co., I. Ehrman, Pres., 41 Park Row, New York, N. Y., plans the construction of an 80 x 150 ft. garage and service station at Columbia and Amity Sts. Estimated cost $40,000. M. Hirsch, 153 Pierrepont St., Archt.

N. Y., Forest Hills—Cord Meyer Development Co., Queens and Continental Aves., will receive bids about June 1 for the construction of a 4 story and service station at Queens Blvd. and Seminole Ave. Estimated cost $200,000. T. Engelhard, c/o owner, Archt. Noted Jan. 30.

N. Y., Oneida — Oneidacraft Inc., awarded contract for the construction of a factory. Estimated cost $125,00.

O., Cleveland—American Steel & Wire Co., J. S. Keefe, Pres., Rockefeller Bldg., is having plans prepared for the construction of a 1 story, 80 x 750 ft. factory for the manufacture of automobile fenders, metal furniture and tubing for metal beds at East 42nd St. and Harvard Ave. Estimated cost $400,000. Private plans.

O., Portsmouth—C. Hurrle, awarded contract for the construction of a 1 story, 56 x 115 ft. garage at 10th and Findlay Sts. Estimated cost $27,000.

Pa., Meadville — Hookless Fastener Co., awarded contract for a 2 story, 50 x 70 ft. addition to factory. Estimated cost $40,000.

Pa., Midland—Pittsburgh Crucible Steel Co., Oliver Bldg., Pittsburgh, awarded contract for the construction of a new blooming mill with electrical equipment here. Estimated cost $700,000. Private plans.

Pa., Philadelphia — Gimbel Bros., 9th and Market Sts., awarded contract for the construction of a 2 story, 124 x 288 ft. garage and service station at Hamilton and 21st Sts. Noted Mar. 20.

Tenn., Knoxville—Imperial Foundries Co., O. H. Shriver, Pres., 218 Kentucky St., plans to rebuild foundry recently destroyed by fire. Loss $15,000 to $18,000.

Tenn., Memphis — Hotel Peabody, A. L. Parker, Pres., is having tentative plans made for a 4 story, 130 x 145 ft. garage on South Second St.

Va., Richmond — Virginia Polytechnic Institute, J. A. Burrus, Pres., is having plans prepared for additional buildings, including mechanical building, etc. Estimated total cost $550,000.

Wash., Bellingham — Puget Sound Power & Light Co., will soon award contract for the construction of a service building. Estimated cost $50,000 to $60,000.

Wis., Milwaukee — Windler's Garage, 1034 Muskego Ave., awarded contract for a 2 story, 60 x 200 ft. garage at Forest Home. Noted Apr. 10.

Ont., Brampton — G. M. Miller & Co., 71 Mutual St., Toronto, Archts., are receiving bids for construction of a 1 story factory for the manufacture of pianos, piano keys, etc., here, for Otto-Higel Co. Ltd., 680 King St. W., Toronto. Estimated cost $75,000.

Ont., Fort William—Bd. of Education is having plans prepared for a technical school. Estimated cost $400,000. R. E. Mason, 2 Francis Blk., Archt.

Ont., Hamilton—B. Greening Wire Co. Ltd., Queen St. N., is having plans prepared for 4 story, 70 x 112 and 1 story, 40 x 45 ft. additions to wire and screen plant. Estimated cost $100,000. B. H. and F. Prack, Pigott Bldg., Archts.

Que., Jolliette—General Conveyors Ltd., plans the construction of a plant for the manufacture of pneumatic tubes.

Que., Levis—Home Lumber Co. Ltd., Three Rivers, is having plans prepared for the construction of a lumber mill here. Estimated cost $100,000.

Que., Montreal — Canadian National Rys., plans a five year improvement program to locomotive and car shops, including large passenger coach yard, new passenger car shop, machine shop and wood mill, etc. C. S. Gzowski, Ch. Engr.

Que., St. Mac des Carrieres — A. Asselin, plans the construction of a saw-mill. Estimated cost $25,000.